



COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DRAFT PERMIT *April 30, 2019*
TO WITHDRAW GROUNDWATER IN THE
EASTERN SHORE GROUNDWATER MANAGEMENT AREA

Permit Number: GW0073000

Effective Date: XXXXXXXX XX, 2019

Expiration Date: XXXXXXXX XX, 2034

Pursuant to Section 62.1-256 of the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) and the Groundwater Withdrawal Regulations (Regulations) (9VAC25-610-10 *et seq.*), the State Water Control Board (Board) hereby authorizes the Permittee to withdraw and use groundwater in accordance with this permit.

Permittee William Davis and Therese B. Lovell

Facility Old Mill Farms

Facility Address 20503 Kendallworth Drive
Melfa, VA 23410

The Permittee's authorized groundwater withdrawal shall not exceed:

12,000,000 gallons per year,
3,100,000 gallons per month.

The permitted withdrawal will be used to provide an agricultural water supply. Other uses are not authorized by this permit.

The Permittee shall comply with all conditions and requirements of the permit.

By direction of the State Water Control Board, this Permit is granted by:

Signed _____

Date _____

Director, Office of Water Supply

This permit is based on the Permittee's application submitted on December 15, 2017, and subsequently amended to include supplemental information provided by the Permittee. The following are conditions that govern the system set-up and operation, monitoring, reporting, and recordkeeping pertinent to the Regulations.

Part I Operating Conditions

A. Authorized Withdrawal

1. The withdrawal of groundwater shall be limited to the following wells identified in the table below. Withdrawals from wells not included in Table 1 are not authorized by this permit and are therefore prohibited. 9VAC25-610-140.A

Table 1

Owner Well Name	DEQ Well #	Well Depth (ft)	Screen Intervals	Aquifer*	Latitude	Longitude	Datum
Well OMF1	100-01383	190	175-190	Upper Yorktown-Eastover	37° 39' 54.3954"	75° 43' 2.6364"	WGS84
Well OMF2	100-01384	190	170-190	Upper Yorktown-Eastover	37° 39' 56.628"	75° 43' 6.5424"	WGS84
Well TAM3	100-01385	190	170-190	Upper Yorktown-Eastover	37° 39' 53.5284"	75° 42' 59.075"	WGS84
Well TAM4	100-01386	200	180-200	Upper Yorktown-Eastover	37° 39' 52.7904"	75° 42' 57.69"	WGS84
Well TAM5	100-01387	195	175-195	Upper Yorktown-Eastover	37° 39' 52.182"	75° 42' 54.784"	WGS84
Well TAM6	100-01388	195	175-195	Upper Yorktown-Eastover	37° 39' 51.2424"	75° 42' 52.132"	WGS84
Well OMF7	100-01389	195	175-195	Upper Yorktown-Eastover	37° 39' 58.4166"	75° 43' 2.874"	WGS84

*Aquifer was determined based on the USGS Eastern Shore Hydrogeologic Framework and will be confirmed using site-specific geophysical data collected as required by this permit.

2. Any actions that result in a change to the well operation, construction, or pump intake setting of wells included in this permit must be pre-approved by the Department of Environmental Quality (Department) in writing prior to implementing the change and a revised GW-2 Form must be submitted to the Department within 30 days after the physical construction of a well is altered or the pump intake setting has been changed. If changes are a result of an emergency, notify the Department within 5 days from the change. 9VAC25-610-140.C

B. Pump Intake Settings

1. The Permittee shall not place a pump or water intake device lower than the top of the uppermost confined aquifer that a well utilizes as a groundwater source or lower than the bottom of an unconfined aquifer that a well utilizes as a groundwater source in order to prevent dewatering of the

aquifer, loss of inelastic storage, or damage to the aquifer from compaction. 9VAC25-610-140.A.6

- Pump settings in individual wells are limited as follows. Any change in the pump setting must receive prior approval by the Department.

Owner Well Name	DEQ Well #	Max Pump Setting (feet below land surface)*
Well OMF1	100-01383	131
Well OMF2	100-01384	131
Well TAM3	100-01385	131
Well TAM4	100-01386	131
Well TAM5	100-01387	131
Well TAM6	100-01388	131
Well OMF7	100-01389	131

*Max pump settings were estimated based on the USGS Eastern Shore Hydrogeologic Framework. Following the collection of the geophysical log data required by this permit, updated site-specific maximum pump setting depths will be provided by the Department to replace these estimated limits.

C. Reporting

- Water withdrawn from each well shall be recorded monthly at the end of each month and reported to the Office of Water Supply, in paper or electronic format, on a form provided by the Department by the tenth (10th) day of each January, April, July and October for the respective previous calendar quarter. Records of water use shall be maintained by the Permittee in accordance with Part III.F, 1 through 5 of this permit. 9VAC25-610-140.A.9
- The Permittee shall report any amount in excess of the permitted withdrawal limit by the fifth (5th) day of the month following the month when such a withdrawal occurred. Failure to report may result in compliance or enforcement activities. 9VAC25-610-140.C
- The following is a summary of reporting requirements for specific facility wells:

Owner Well Name	DEQ Well #	Reporting Requirements
Well OMF1	100-01383	Water Use
Well OMF2	100-01384	Water Use
Well TAM3	100-01385	Water Use
Well TAM4	100-01386	Water Use
Well TAM5	100-01387	Water Use
Well TAM6	100-01388	Water Use
Well OMF7	100-01389	Water Use

D. Water Conservation and Management Plan

- The Water Conservation and Management Plan (WCMP) submitted in the application received December 18, 2017 and subsequently amended and then approved by the Department is incorporated by reference into this permit and shall have the same effect as any condition contained in this permit and may be enforced as such.
- By the end of the first year of the permit cycle [date] the Permittee shall submit a detailed description of their leak detection and repair program activities and documentation to the Department that these activities have been conducted. This documentation shall include frequency of

the activities completed and the findings and results of the activities during the first year of the permit term. 9VAC25-610-100.B.1.b,2.b,or 3.b

3. As soon as completed but not later than the end of the second year of the permit cycle [date], the Permittee shall submit to the Department results of a 12 month audit of the total amount of groundwater used in the distribution system and the separate amounts used for drinking and cooling. This audit report shall include the flock cycle start and end dates during the year, and any necessary changes to the leak detection and repair program or operations that affected water use. 9VAC25-610-100.B.1.b,2.b,or 3.b
4. A report on the plan's effectiveness in maintaining or reducing water use and a summary of proposed revisions to the WCMP to address any elements that can be improved based on operations to date shall be submitted by the end of years five [date] and ten [date] of the permit term. These reports shall include as appropriate: 9VAC25-610-140.C
 - a. Any new water saving equipment installed or water saving processes adopted;
 - b. A summary of the operation of the cooling system for the houses during the report period including what months the cooling system was operated;
 - c. Evaluation of the leak detection and repair program with a summary of any significant leaks found and repaired; and
 - d. A summary of the flock cycles and overall water use patterns for each year covered by the report.
5. If revisions or additions to the plan are necessary an updated WCMP shall be submitted to the Department for approval along with the report prior to implementation of the revised plan
6. Records of activities conducted pursuant to the WCMP are to be submitted to DEQ upon request.

E. Mitigation Plan

The Mitigation Plan approved on June 15, 2018 by the Department is incorporated by reference into this permit and shall have the same effect as any condition contained in this permit and may be enforced as such. 9VAC25-610-110.D.3.g

F. Well Tags

1. Each well that is included in this permit shall have affixed to the well casing, in a prominent place, a permanent well identification plate that records, at a minimum, the DEQ well identification number, the groundwater withdrawal permit number, the total depth of the well, and the screened intervals in the well. Such well identification plates shall be in a format specified by the Board and are available from the Department. 9VAC25-610-140.A.12
2. Well tags shall be affixed to the appropriate well casing within 30 days of receiving the tags from the Department. The accompanying well tag installation certification form shall be returned to the Department within 60 days of receipt of the tags. 9VAC25-610-140.C

Part II Special Conditions

Pursuant to 9VAC25-610-140.B and C, the following Special Conditions apply to this permit in order to protect the public welfare, safety, and health or conserve, protect and help ensure the beneficial use of groundwater.

A. Geophysical Log Data Collection

By April 30, 2022 a complete suite of geophysical logs (Spontaneous Potential, Single Point Resistance, 16/64 Short and Long Normal, Natural Gamma at a scale of 20 ft per inch) shall be obtained from at least two boreholes at the locations and depths approved by the Department during the coordination process. Given the unknown hydrogeology at the site and the known potential for significant horizontal variability, additional geophysical logs may be required as determined by the Department during the drilling work to assess the well field area. An electronic and hard copy of the geophysical logs shall be submitted to the Department within 30 days of collection to allow determination of the top and bottom of the aquifer in use. 9VAC25-610-140.C

At least two months prior to the scheduled geophysical logging, the Permittee shall notify the Department of the drilling timetable to receive any further guidance needed on performing the geophysical logging and to allow scheduling of Department staff to make a site visit during the drilling of the borehole and/or the geophysical logging. Geophysical log data collected without the oversight of the Department will not be accepted.

B. Meter Installation Verification/Correction

If notified by DEQ through an inspection report that meters meeting the requirements set forth in Part III Condition I of this permit have not been correctly installed on each production well in such a manner as to record total withdrawals from the well including both cooling water and drinking water, the Permittee shall correct any identified meter issues within 60 days of notification.

C. Pump Intake Determination and Reset

Within 90 days of notification of the maximum pump setting depth as determined by Department staff based on new geophysical log data obtained by the Permittee as required by the permit, the Permittee shall submit documentation from a certified well provider, or other source as accepted by the Department, that ensure the pump intake for each production well is set above the setting stated in the notification.

D. Alternative Source Investigation

1. By September 30, 2023 the Permittee shall conduct an investigation of the surficial aquifer (Columbia) to evaluate the ability of the surficial aquifer to provide all or part of the water supply needs for the facility. The investigation shall include water quality and pump test data collected from a surficial aquifer test well constructed on-site with Department oversight to ensure the well is properly screened in the surficial aquifer. A geophysical log shall be obtained from the surficial

aquifer test well per Part III.K of the permit unless a geophysical log collected from an existing production well is accepted by DEQ as representing the Columbia aquifer at the test well location. An existing well screened in the surficial aquifer located on or near the facility property may be used where approved by DEQ as an alternative. An existing well must have sufficient well construction information available to verify it is screened in the surficial aquifer and properly constructed in order to be considered.

2. A report on the results of the investigation shall be provided to DEQ by March 31, 2024.

Part III

General Conditions

A. Duty to Comply

The Permittee shall comply with all conditions of the permit. Nothing in this permit shall be construed to relieve the permit holder of the duty to comply with all applicable federal and state statutes, regulations and prohibitions. Any permit violation is a violation of the law and is grounds for enforcement action, permit termination, revocation, modification, or denial of a permit application. 9VAC25-610-130.A

B. Duty to Cease or Confine Activity

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the activity for which a permit has been granted in order to maintain compliance with the conditions of the permit. 9VAC25-610-130.B

C. Duty to Mitigate

The Permittee shall take all reasonable steps to avoid all adverse impacts that may result from this withdrawal as defined in 9VAC25-610-10 and provide mitigation of the adverse impact when necessary as described in 9VAC25-610-110.D.3.g. 9VAC25-610-130.C

D. Inspection, Entry, and Information Requests

Upon presentation of credentials, the Permittee shall allow the Board, the Department, or any duly authorized agent of the Board, at reasonable times and under reasonable circumstances, to enter upon the Permittee's property, public or private, and have access to, inspect and copy any records that must be kept as part of the permit conditions, and to inspect any facilities, well(s), water supply system, operations, or practices (including sampling, monitoring and withdrawal) regulated or required under the permit. For the purpose of this section, the time for inspection shall be deemed reasonable during regular business hours. Nothing contained herein shall make an inspection time unreasonable during an emergency. 9VAC25-610-130.D

E. Duty to Provide Information

The Permittee shall furnish to the Board or Department, within a reasonable time, any information that the Board may request to determine whether cause exists for modifying or revoking, reissuing, or

terminating the permit, or to determine compliance with the permit. The Permittee shall also furnish to the Board or Department, upon request, copies of records required to be kept by regulation or this permit. 9VAC25-610-130.E

F. Monitoring and Records Requirements

1. The Permittee shall maintain a copy of the permit on-site and/or shall make the permit available upon request. 9VAC25-610-130.E
2. Monitoring of parameters shall be conducted according to approved analytical methods as specified in the permit. 9VAC25-610-130.F.1
3. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. 9VAC25-610-130.F.2
4. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart or electronic recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit, for a period of at least three years from the date of the expiration of a granted permit. This period may be extended by request of the Board at any time. 9VAC25-610-130.F.3
5. Records of monitoring information shall include as appropriate: 9VAC25-610-130.F.4
 - a. the date, exact place and time of sampling or measurements;
 - b. the name(s) of the individual(s) who performed the sampling or measurements;
 - c. the date the analyses were performed;
 - d. the name(s) of the individual(s) who performed the analyses;
 - e. the analytical techniques or methods supporting the information, such as observations,
 - f. readings, calculations and bench data used;
 - g. the results of such analyses; and
 - h. chain of custody documentation.

G. Environmental Laboratory Certification

The Permittee shall comply with the requirement for certification of laboratories conducting any tests, analyses, measurements, or monitoring required pursuant to the State Water Control Law (§ [62.1-44.2](#) et seq.), Environmental Laboratory Certification Program (§ 2.2-1105 et seq.), Certification for Noncommercial Environmental Laboratories (1VAC30-45), and/or Accreditation for Commercial Environmental Laboratories (1VAC30-46), and

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- a. Ensure that all samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- b. Conduct monitoring according to procedures approved under 40CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency.
- c. Periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will ensure accuracy of measurements. (1VAC30-45-20)

H. Future Permitting Actions

1. A permit may be modified or revoked as set forth in Part VI of the Regulations. 9VAC25-610-290 and 9VAC25-610-130.G
2. If a Permittee files a request for permit modification or revocation, or files a notification of planned changes, or anticipated noncompliance, the permit terms and conditions shall remain effective until the Board makes a final case decision. This provision shall not be used to extend the expiration date of the effective permit. 9VAC25-610-130.G
3. Permits may be modified or revoked upon the request of the Permittee, or upon Board initiative, to reflect the requirements of any changes in the statutes or regulations. 9VAC25-610-130.G
4. The Permittee shall schedule a meeting with the Department prior to submitting a new, expanded or modified permit application. 9VAC25-610-85
5. A new permit application shall be submitted 270 days prior to the expiration date of this permit, unless permission for a later date has been granted by the Board, to continue a withdrawal greater than or equal to 300,000 gallons in any month while an application for a renewal is being processed. 9VAC25-610-96
6. A new permit application shall be submitted 270 days prior to any proposed modification to this permit that will (i) result in an increase of withdrawal above permitted limits; or (ii) violate the terms and conditions of this permit. 9VAC25610-96
7. The applicant shall provide all information described in 9VAC25-610-94 for any reapplication. 9VAC25-610-96.C
8. The Permittee must notify the Department in writing of any changes to owner and facility contact information within 30 days of the change. 9VAC25-610-140.C

I. Metering and Equipment Requirements

1. Each well and/or impoundment or impoundment system shall have an in-line totalizing flow meter to read gallons, cubic feet, or cubic meters installed prior to beginning the permitted use. Meters shall produce volume determinations within plus or minus 10% of actual flows. 9VAC25-610-140.A.7.b
 - a. A defective meter or other device must be repaired or replaced within 30 days.

- b. A defective meter is not grounds for not reporting withdrawals. During any period when a meter is defective, generally accepted engineering methods shall be used to estimate withdrawals. The period during which the meter was defective must be clearly identified in the groundwater withdrawal report required by Part I, Subsection D of this permit. An alternative method for determining flow may be approved by the Board on a case-by-case basis.
2. Each well shall be equipped in a manner such that water levels can be measured during pumping and non-pumping periods without dismantling any equipment. Any opening for tape measurement of water levels shall have an inside diameter of at least 0.5 inches and be sealed by a removable plug or cap. The Permittee shall provide a tap for taking raw water samples from each permitted well. 9VAC25-610-140.A.7.e

J. Minor Modifications

1. A minor modification to this permit must be made to replace an existing well(s) or add an additional well(s) provided that the well(s) is screened in the same aquifer(s) as the existing well(s), and is in the near vicinity of the existing well(s), the total groundwater withdrawal does not increase, the area of impact does not increase, and the well has been approved by the Department prior to construction. 9VAC25-610-330.B.4 and 5
2. A minor modification to this permit must be made to combine withdrawals governed by multiple permits when the systems are physically connected as long as interconnection will not result in additional groundwater withdrawal and the area of impact will not increase. 9VAC25-610-330.B.6
3. Minor modifications to this permit must also be made to:
 - a. Change an interim compliance date up to 120 days from the original compliance date, as long as the change does not interfere with the final compliance date. 9VAC25-610-330.B.7
 - b. Allow for change in ownership when the Board determines no other change in the permit is necessary and the appropriate written agreements are provided in accordance with the transferability of permits and special exceptions. 9VAC25-610-320 and 9VAC25-610-330.B.8
 - c. Revise a Water Conservation and Management Plan to update conservation measures being implemented by the Permittee that increase the amount of groundwater conserved. 9VAC25-610-330.B.9

K. Well Construction

At least 30 days prior to the scheduled construction of any well(s), the Permittee shall notify the Department of the construction timetable and receive prior approval of the well(s) location(s) and acquire the DEQ Well number. All wells shall be constructed in accordance with the following requirements.

1. A well site approval letter or well construction permit must be obtained from the Virginia Department of Health prior to construction of the well. 9VAC25-610-130.A

2. A complete suite of geophysical logs (Spontaneous Potential, Single Point Resistance, 16/64 Short and Long Normal, Natural Gamma) shall be completed for the well and submitted to the Department along with the corresponding completion report. 9VAC25-610-140.C
3. The Permittee shall evaluate the geophysical log and driller's log information to estimate the top of the target aquifer and; therefore, a depth below which the pump shall not be set. The Permittee's determination of the top of the target aquifer shall be submitted to the Department for review and approval, or approved on site by the Department's Groundwater Characterization staff, prior to installation of any pump. 9VAC25-610-140.A.6
4. The Permittee shall install gravel packs and grout in a manner that prevents leakance between aquifers. Gravel pack shall be terminated close to the top of the well screen(s) and shall not extend above the top of the target aquifer. 9VAC25-610-140.C
5. A completed GW-2 Form and any additional water well construction documents shall be submitted to the Department within 30 days of the completion of any well and prior to the initiation of any withdrawal from the well. 9VAC25-610-140.C. The assigned DEQ Well number shall be included on all well documents. 9VAC25-610-140.C
6. In addition to the above requirements, construction of a Water Level Monitoring State Observation Well (SOW) requires:
 - a. The Permittee shall coordinate activities with the Department's Groundwater Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C
 - b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents. At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C
 - c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C
7. In addition to the above requirements, construction of a Chloride Monitoring SOW requires:
 - a. The Permittee shall coordinate activities with the Department's Groundwater Characterization Program (GWCP) to determine the appropriate observation well location and construction schedule, along with the needed screen interval(s), and other completion details following review of geophysical logging. 9VAC25-610-140.C
 - b. Prior to preparation of bid documents for construction of the observation well, the Permittee shall notify the Department and shall include any GWCP requirements in the bid documents.

At a minimum, the Department will require a pre-bid meeting with interested drilling contractors and a pre-construction meeting with the successful bidder. 9VAC25-610-140.C

- c. Instrumentation to meet the requirements for real-time data transmission consistent with the State Observation Well Network shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C
- d. Instrumentation to meet the requirements for continuous measurement of specific conductance from multiple levels within the well screen shall be purchased by the Permittee. The Permittee shall submit a purchase order based on the Department's equipment specifications for review and approval prior to purchase of the equipment. The Permittee shall not be required to install the equipment. 9VAC25-610-140.C

L. Permit Reopening

This permit may be reopened for the purpose of modifying the conditions of the permit as follows:

- a. To meet new regulatory standards duly adopted by the Board. 9VAC25-610-140.A.11
- b. When new information becomes available about the permitted withdrawal, or the impact of the withdrawal, which had not been available at permit issuance and would have justified the application of different conditions at the time of issuance. 9VAC25-610-310.B.1
- c. When the reported withdrawal is less than 60% of the permitted withdrawal amount for a five year period. 9VAC25-610-310.B.2
- d. If monitoring information indicates the potential for adverse impacts to groundwater quality or level due to this withdrawal. 9VAC25-610-140.C

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

PERMIT ISSUANCE FACT SHEET (April 30, 2019)

Groundwater Withdrawal Permit Number: GW0073000

Application Date: December 15, 2017

The Department of Environmental Quality (Department or DEQ) has reviewed the application for a Groundwater Withdrawal Permit. Based on the information provided in the application and subsequent revisions, DEQ has determined that there is a reasonable assurance that the activity authorized by the permit is a beneficial use as defined by the regulations. Groundwater impacts have been minimized to the maximum extent practicable. The following details the application review process and summarizes relevant information for developing the Permit and applicable conditions.

Permittee / Legal Responsible Party

Name & Address: William Davis and Therese B. Lovell
1 Mount Prospect Ave.
Onancock, VA 23417
Phone: (757) 787-3507

Facility Name and Address

Name & Address: Old Mill Farms
20503 Kendallworth Drive
Melfa, VA 23410
Phone: (757) 787-3507

Contact Information:

Name: Therese B. Lovell, Vice President
E-mail: dtjslovel@msn.com
Phone: (757) 787-3507

Proposed Beneficial Use:

The proposed use for this withdrawal is for agriculture. Withdrawals will supply a poultry growing operation with water for cooling of chicken houses as well as for direct consumption by poultry.

Processing Dates

Processing Action	Date Occurred/Received
Pre-Application Meeting:	October 16, 2017
Application Received:	December 18, 2017
Permit Fee Deposited by Accounting:	Not Applicable
Notice of Deficiency Sent	February 22, 2018
Response to Notice of Deficiency Received:	March 28, 2018
Request for Additional Information Sent:	April 16, 2018
Response to Request for Additional Information Received:	June 15, 2018
Local Government Ordinance Form Received:	June 13, 2018
Application Complete:	June 15, 2018
Submit Request for Technical Evaluation:	December 18, 2018
Technical Evaluation Received:	February 13, 2019
Draft Permit Package Sent:	TBD
Submit Draft Permit for Public Notice:	TBD
Public Notice Published:	TBD
End of 30-Day Public Comment Period:	TBD
Response to Public comment:	TBD
Public Meeting or Hearing:	TBD

Application

Application Information

Old Mill Farm is a poultry farm owned by William Davis and Therese B. Lovell and located in Accomack County. Old Mill Farm has eleven poultry houses and seven production wells. The houses are sized as follows: Four houses are 500 ft long by 40 ft wide and have 4 drinker lines which run the length of the houses. Two houses are 500 feet long by 42 feet wide and have 4 drinker lines which each run the length of the houses. Two houses are 500 feet long by 50 feet wide and have 6 drinker lines which each run the length of the houses. Three houses are 560 feet long by 61 feet wide and have 6 drinker lines which each run the length of the house. The farm produces broilers. A small amount of water is used for general farm operation including washing equipment, cleaning houses between flocks, and occasional tree irrigation. Additional information on how water is used at the farm is discussed in the basis of need section of the fact sheet.

The houses were constructed between 1991 and 2010. Well OMF1 was constructed in 1991, OMF2 in 1997, TAM3 in 2000, TAM4 in 2003, and TAM5, TAM6, and OMF7 were constructed in 2010.

Location of Facility/Withdrawal:

Water Supply Planning Unit: Accomack & Northampton

County: Accomack County

GWMA/Aquifer: Eastern Shore/ Upper Yorktown-Eastover

Conjunctive Use Source: This system uses no surface water and is therefore not a conjunctive use system.

Withdrawal Use, Current Need, and Projected Demand:

Basis of Need:

Poultry farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads designed to regulate temperatures in the house and keep the birds cool. Cooling is primarily required in summer.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a predictable pattern every 50-60 days, or the length of time it takes to raise a flock, with increased usage primarily resulting from increased water consumption as the birds gain weight. This water use pattern starts with low water consumption volumes for chick development and peaks in the last 20-30 days as growers seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes.

Water volumes used for consumption are controlled by a computer system that provides water to the drinker system, which provides access to water for the birds but limits spillage or excess moisture from entering the house. Avoiding excess moisture is critical to bird health and as a result careful conservation of water is already a key tenet of management in a broiler house. The computer tracks water supplied to the drinking system and records the volume. This data was maintained by some farms but in many cases was not recorded long-term. Where available, data from the computer is discussed in the historic withdrawals section of the factsheet.

The cooling systems are operated based on temperature and humidity and while usage is typically restricted to summers, operation of the cooling systems tends to vary between farms. Historically, water supplied to the cooling systems was not metered so very limited data is available on usage.

Water Demand Projection: Water demands are based on estimated drinking and cooling water amounts needed to supply all the system houses. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was calculated based on comparable farm information as the metered drinking water data for the system had not been retained.

As no data on volumes used for cooling was available from farms operating on the shore, a procedure for estimating water use for cooling was developed for use based on discussions with industry stakeholders, individual farmers, and a review of available literature. House size and cooling fan capacity were identified as the major variables determining water use for cooling poultry houses. A formula based on 1.6 gallons per year per cubic foot per minute (cfm) of cooling fan capacity was determined to be representative for the Delmarva area poultry industry. The major variable for cooling fan capacity is the width of the house as that provides for the number and size of cooling fans that can be installed. The combined total width of the

houses for the facility was used as the basis to estimate cooling water use. The water use calculations are attached to the fact sheet. The permit requires metering of the wells to record total water use and actual amounts used for cooling will be collected.

A small amount of water is used for general farm operation including washing equipment, cleaning houses between flocks, and occasional tree irrigation. An amount of 100,000 g/y was estimated for these uses.

Water demands are not expected to change as the amount requested represents the maximum capacity of the farm and no additional houses are considered in this permit. Therefore, no projections are included for this facility.

Withdrawal Volumes Requested: The applicant requested the following withdrawal volumes based upon the projected groundwater demand.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	3,100,000	0.1033
Maximum Annual:	12,000,000	0.0328

DEQ Evaluation

Historic Withdrawals:

No record of historic withdrawals was available for this facility as the metered data for the drinking or consumption water was not retained. Refer to the attached Water Use Calculations for more information on how water use was estimated.

Analysis of Alternative Water Supplies: The Eastern Shore of Virginia is an area primarily served by groundwater with the majority of withdrawals coming from the three confined Yorktown-Eastover (Upper/Middle/Lower) aquifers. There is limited surface water availability with the majority of streams being too small to supply sufficient water for most purposes, larger water bodies are typically tidally influenced, and water quality concerns have limited the development of these sources. Withdrawals from the surficial aquifer, or water table, are one viable alternative to withdrawals from the confined system. While withdrawals from the surficial aquifer can present additional water quality challenges in the form of iron forming bacteria and increased vulnerability to surface contaminants, it may be viable in some locations where capacity and quality are sufficient. In general, drinking water for poultry must be of higher quality than the cooling water. In most cases, site-specific data will be necessary to determine the viability of the surficial aquifer and to determine what portions of the use it can supply.

Public Water Supply: The proposed withdrawal does not contain a public water supply component.

Water Supply Plan Review: A Water Supply Planner coordination request was sent on September 10, 2018 and a response was received on January 9, 2019. The response noted several key items.

The Accomack County Regional Water Supply Plan (Plan) includes irrigating agricultural facilities using both groundwater and surface water, with current permitted amounts sufficient to meet demands into 2040. The plan, however, does not include existing poultry farms in their assessments. While the seafood industry could also show future growth in the region, Section 4.0 of the ANPDC Groundwater Management Plan details industrial water for seafood and poultry processing, noting over 90% of industrial groundwater usage is related to poultry processing. WSP Staff note existing water quality concerns for surface waters and no significant water surpluses or sources in Accomack County to serve as alternative sources. Additionally, WSP staff reviewed the current alternatives under consideration, such as water table wells, and noted that the ability of the National Resources Conservation Service's (NRCS) Environmental Quality Incentives Program (EQIP) program to fund such efforts is currently unknown. The current lack of inclusion of poultry in the region's plan, existing water quality and alternative source concerns, and the unknown status of funding for alternative development underlines potential regional resource concerns to be addressed in future planning efforts.

DEQ Recommended Withdrawal Limits: The recommended withdrawal limits are based on the total of both consumption (drinking water) and cooling. Water use for consumption was evaluated based on a 1.57 gal/ft² amount calculated from the DEQ provided example data from an example farm. The consumption data provided was reviewed and DEQ staff determined that it provided a reasonable basis for estimating monthly and annual consumption for the facility. DEQ staff also evaluated the water use calculations from other farms and determined the values used for Old Mill Farms provided a reasonable estimate of annual and monthly withdrawal amounts for the size farm.

DEQ staff evaluated the volumes requested for cooling and determined they were accurately calculated using the procedure discussed in more detail above. Given the lack of data available for evaluating poultry water use, DEQ believes the methods employed are conservative enough to provide sufficient water for the farm to continue operation while still providing a reasonable limit for the permits. It is expected that as more metered data becomes available, withdrawal limits may be reduced in cases where actual water use is significantly lower than the permit limits.

Withdrawal limits were rounded to nearest hundred thousand in accordance with DEQ's April 6, 2015 "Rounding Memo". DEQ recommends the following withdrawal volumes based upon evaluation of the groundwater withdrawal permit application.

Period of Withdrawal	Actual Volume (gal.)	Volume in MGD
Maximum Monthly:	3,100,000	0.1033
Maximum Annual:	12,000,000	0.0328

Technical Evaluation:

Aquaveo, LLC performed a technical evaluation of the application for the Department based on the VAHydroGW-ES model. As an aquifer pump test was not performed, the properties from the VAHydroGW-ES model were used to simulate the potential drawdown resulting from the proposed withdrawal. The model uses a base simulation which includes all existing permits (except the applicant wells) operating at their 2017 maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders.

This base simulation is then executed for 50 years. A second 50-year simulation was then conducted using the VAHydroGW-ES model with the applicant's proposed withdrawals added to the base simulation to simulate drawdown resulting from the applicant's wells using the proposed withdrawal volumes. The objectives of this evaluation were to determine the areas of any aquifers that will experience at least one foot of water level decline due to the proposed withdrawal (the Area of Impact or AOI), to determine the potential for the proposed withdrawal to cause salt-water intrusion, and to determine if the proposed withdrawal meets the 80% drawdown criteria. A summary of the results of the evaluation are provided below and the full technical evaluation is attached to this fact sheet as Attachment 2.

Aquaveo, LLC reviewed and compared simulated 2017 water levels from the reported use to USGS measured water levels in observation wells closest to the applicant's withdrawal for the same year for the Upper, Middle, and Lower Yorktown-Eastover aquifers. Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES. They noted that the water levels obtained from the regional observation networks for the Upper, Middle, and Lower Yorktown-Eastover aquifers show variation of up to 2 to 10 ft higher or lower than the simulated water levels. Aquaveo also noted that the observed water levels in all three aquifers exhibit yearly fluctuations in water levels of approximately 2 to 10 ft. Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Aquaveo concluded that while there are some variations between the observed and simulated water levels, the fluctuations and general patterns observed in the USGS wells are simulated by the VAHydroGW-ES and the water levels from the two sources are in general agreement. Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES.

The potential for adverse changes to water quality due to the requested withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. The results indicated that no model cells simulate an increase in chloride concentration greater than 20 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality as a result of the proposed withdrawal.

The results of the VAHydroGW-ES simulations, predict areas of impact due to the proposed withdrawal in the Upper and Middle Yorktown-Eastover aquifers. The AOI areas extend a maximum distance of approximately 0.6 and 0.4 miles from the production center for the Upper and Middle Yorktown-Eastover aquifers.

Adding the proposed withdrawal to the model simulated results in simulated water levels at 15.3, 17.7, and 13.5 feet msl for the Upper, Middle, and Lower Yorktown-Eastover aquifers, respectively. The 80% drawdown criterion allows the potentiometric water level (based on the critical surface elevation calculated from the VAHydroGW-ES data) to be reduced to -65.5, -121.0, and -182.5 feet msl in the Upper, Middle, and Lower Yorktown-Eastover aquifers, respectively. Therefore, the water levels in the VAHydroGW-ES cell containing the applicant wells for each confined aquifer are not simulated to fall below the critical surface. Additionally, no new VAHydroGW-ES cells are simulated to have water levels fall below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

Aquaveo, LLC concluded that the proposed withdrawals meet technical criteria for permit issuance. Maps of the AOIs are included in the attached Mitigation Plan.

Part I Operating Conditions

Authorized Withdrawals:

Owner Well Name	DEQ Well #	Aquifer*	Type	Max Pump Setting (ft. bsl)*
Well OMF1	100-01383	Upper Yorktown-Eastover	Production	131
Well OMF2	100-01384	Upper Yorktown-Eastover	Production	131
Well TAM3	100-01385	Upper Yorktown-Eastover	Production	131
Well TAM4	100-01386	Upper Yorktown-Eastover	Production	131
Well TAM5	100-01387	Upper Yorktown-Eastover	Production	131
Well TAM6	100-01388	Upper Yorktown-Eastover	Production	131
Well OMF7	100-01389	Upper Yorktown-Eastover	Production	131

*Aquifer in use and max pump settings were estimated based on the USGS Eastern Shore Hydrogeologic Framework and will be updated using site-specific geophysical data collected as required by this permit.

Apportionment: Apportionment of withdrawals is expected to be fairly equally spread across all facility wells and the permit does not include apportionment limits.

Additional Wells:

Observation Wells, Abandoned Wells or Out of Service Wells: No observation wells, abandoned wells, or out of service wells are known to be associated with the facility

Pump Intake Settings: The pump intake settings have not been determined for the seven facility wells.

No geophysical log data or geologist logs were available for this site and therefore aquifer elevation for the top of the aquifer in use was estimated using the USGS Eastern Shore Hydrogeologic Framework. Once geophysical log data is obtained in compliance with the permit, DEQ geologists will determine the top of the aquifer in use, which will be the pump intake limit above which the pumps must be set. The permittee will have 90 days to ensure all pumps meet the intake limits once notified of the limits by DEQ.

Withdrawal Reporting: Groundwater withdrawals are to be recorded monthly and reported quarterly.

Water Conservation and Management Plan:

A Water Conservation and Management Plan (WCMP) meeting the requirements of 9VAC25-610-100.B was submitted and reviewed as part of the application process. The accepted Plan is to be followed by the permittee as an operational Plan for the facility/water system.

- A detailed description of the leak detection and repair program activities and documentation to the Department that these activities have been conducted is due by the end of the first year of the permit term.

- A result of a 12 month audit of the total amount of groundwater used in the distribution system and the amounts for drinking and cooling water, documentation of the flock cycle start and end dates, and any necessary changes to the operation affecting water use is due by the end of the second year of the permit term.
- A report on the plan's effectiveness in maintaining or reducing water use amounts needed, including revisions to those elements of the WCMP that can be improved and addition of other elements found to be effective based on operations to date shall be submitted by the end of years five [date] and ten [date] of the permit term.

Mitigation Plan:

The predicted AOI resulting from the Technical Evaluation extends beyond the property boundaries in the Upper and Middle Yorktown-Eastover aquifers. Given this prediction, a Mitigation Plan to address potential claims from existing well owners within the predicted area of impact is included in the permit by reference.

Well Tags: Well tags will be transmitted with the final permit.

Part II Special Conditions

Geophysical Log Data Collection: Geophysical log information is needed to evaluate the top of the aquifer in use and the regulatory permitted pump intake limit, and to determine whether the current pump settings meet regulatory limitations. The Department requires collection of a geophysical log for each new well to be included in a Groundwater Withdrawal Permit. Given the large number of wells associated with poultry facilities, the Department agreed to work with applicants that had constructed wells prior to application to allow for a reduced number of geophysical logs required to represent the wells keeping in mind the need to evaluate lateral variation in the hydrogeology. The Permittee must contact DEQ at least two months prior to scheduling the geophysical logs to allow for Department scheduling.

The collection of geophysical log data requires a borehole to be drilled at least to the depth of the deepest facility well, or an alternative depth at the discretion of the Department, and the logging equipment run down the full depth of the hole. Geophysical logging is to include 16"/64" Normal, Single Point, Self Potential, and Natural Gamma at a scale of 20 feet per inch. Collection of a full suite of geophysical logs and a drillers log is required at two locations and depths approved by DEQ by April 30, 2022. Additional geophysical log locations may be required by Department staff as warranted depending on site hydrogeology to evaluate lateral variation in the aquifer top elevations. These logs will be used to represent the remaining facility wells. Department staff must be present for the geophysical logging to evaluate the log and well cuttings.

Pump Intake Determination and Reset: Within 90 days of notification of pump intake limits by the Department based on the geophysical data, the permittee shall ensure all pump intakes are set above the identified limits. The Permittee is to notify the Department of the work schedule and to submit written documentation of the pump setting within 30 days of the work.

Meter Installation/Verification: Well OMF1 supplies houses 2 and 3. Well OMF2 supplies houses 1 and 4. Well TAM3 supplies houses 6 and 7. Well TAM4 supplies houses 8 and 9. Well TAM5 supplies house 10. Well TAM 6 supplies house 11. Well OMF7 supplies house 5. Houses 5, 10, and 11 are the three larger houses. At the time of application, the meters were in-line to the houses after the cooling water distribution; so the meters measured drinking only. Confirmation that meters have been correctly installed capture the total water use of each well is needed.

Alternative Source Investigation: The facility is supplied by wells screened in the confined Upper Yorktown-Eastover aquifer. The confined aquifer system on the Eastern Shore is considered to be of higher quality than the surficial (water table) aquifer and is the potable water supply for the majority of the Eastern Shore. The regulation requires the lowest quality water available be applied to the permitted use. While the application states generally that the surficial aquifer would not be viable, site specific investigation is necessary to evaluate the surficial aquifer quality and availability. By September 30, 2023, an alternative source investigation must be completed and the results submitted to DEQ by March 31, 2024 for review and acceptance. The investigation shall provide pump test and water quality data from a test or production well screened in the surficial aquifer on the facility site as well as conclusions on the capability of the surficial aquifer to supply all or part of the water needs for the facility.

Part III General Conditions

General Conditions are applied to all Groundwater Withdrawal Permits, as stated in the Groundwater Withdrawal Regulations, 9VAC25-610-10 *et seq.*

Public Comment

Relevant Regulatory Agency Comments:

Summary of VDH Comments and Actions: This facility is not a public water supply so soliciting comments from VDH was not required.

Public Involvement during Application Process:

Local and Area wide Planning Requirements: The Accomack County Administrator indicated on April 6, 2018 that the facility's operations are consistent with all ordinances.

Public Comment/Meetings:

The public notice was published in xxxxxx on XXX. The public comment period ran from xxxxx to xxxxx

Changes in Permit Part II Due to Public Comments

Changes in Permit Part III Due to Public Comments

Staff Findings and Recommendations

Based on review of the permit application, staff provides the following findings.

- The proposed activity is consistent with the provisions of the Ground Water Management Act of 1992, and will protect other beneficial uses.
- The proposed permit addresses minimization of the amount of groundwater needed to provide the intended beneficial use.
- The effect of the impact will not cause or contribute to significant impairment of state waters.
- This permit includes a plan to mitigate adverse impacts on existing groundwater users.

Staff recommends Groundwater Withdrawal Permit Number GW0073000 be issued as proposed.

Attachments

- 1. Technical Evaluation**
- 2. Water Use Calculations**
- 3. Water Conservation Plan**
- 4. Mitigation Plan**
- 5. Public Comment Sheet**

Approved: _____
Director, Office of Water Supply

Date: _____

MITIGATION PLAN

DEQ GROUNDWATER WITHDRAWAL PERMIT NO. GW0073000

OWNER NAME: William Davis and Therese Lovell

FACILITY NAME: Old Mill Farms

LOCATION: 20503 Kendallworth Drive, Melfa, VA 23410

INTRODUCTION

On December 15, 2017, William Davis and Therese Lovell submitted a Groundwater Withdrawal Permit Application to the Virginia Department of Environmental Quality (DEQ) to withdraw groundwater. Groundwater withdrawals associated with this permit will be utilized to for consumption by chickens, cooling the birds and facilities management of a poultry farm.

The purpose of this Mitigation Plan is to provide existing groundwater users a method to resolve claims that may arise due to the impact of the withdrawal from Old Mill Farms well field. Predicted drawdown of water levels due to the withdrawal(s) from the Yorktown/Eastover aquifer(s) are shown in the attached maps(s).

Modeled impacts, as shown on the attached maps, extend beyond the boundary of the Old Mill Farms facility. Due to these findings, William Davis and Therese Lovell (also referred to as “Owner”) recognizes that there will be a rebuttable presumption that water level declines that cause adverse impacts to existing groundwater users within the area of impact are due to this withdrawal. Claims may be made by groundwater users outside this area; however, there is a rebuttable presumption that Old Mill Farms has not caused the adverse impact. William Davis and Therese Lovell propose this plan to mitigate impacts to existing users and excludes impacts to wells constructed after the effective date of this permit.

CLAIMANT REQUIREMENTS

To initiate a claim, the claimant must provide written notification of the claim to the following address:

Contact Name	<u>Therese Lovell</u>
Title	<u>Vice President</u>
Permittee Name	<u>Old Mill Farms</u>
Address	<u>1 Mount Prospect Ave.</u>
City, State Zip Code	<u>Onancock, VA 23417</u>

The claim must include the following information: (a) a deed or other available evidence that the claimant is the owner of the well and the well was constructed and operated prior to the effective

date of the permit; (b) all available information related to well construction, water levels, historic yield, water quality, and the exact location of the well sufficient to allow William Davis and Therese Lovell to locate the well on the claimant's property; (c) the reasons the claimant believes that the Old Mill Farms withdrawal has caused an adverse impact on the claimants well(s).

CLAIM RESOLUTION

William Davis and Therese Lovell will review any claim within **five (5) business days**. If William Davis and Therese Lovell (Owner) determines that no rebuttal will be made and accepts the claim as valid, the Owner will so notify the claimant and will implement mitigation within **thirty (30) business days**. If the claim is not accepted as valid, William Davis and Therese Lovell will notify the claimant that (a) the claim is denied **or** (b) that additional documentation from the claimant is required in order to evaluate the claim. Within **fifteen (15) business days** of receiving additional documentation from the claimant, William Davis and Therese Lovell will notify the claimant (a) that the Owner agrees to mitigate adverse impacts or (b) the claim is denied. If the claim is denied, the claimant will be notified that the claimant may request the claim be evaluated by a three (3) member committee. This committee will consist of one (1) representative selected by William Davis and Therese Lovell, one (1) representative selected by the claimant, and one (1) representative mutually agreed upon by the claimant and William Davis and Therese Lovell.

Any claimant requesting that a claim be evaluated by the committee should provide the name and address of their representative to William Davis and Therese Lovell. Within **five (5) business days** of receipt of such notification, the Owner will notify the claimant and claimant's representative of the identity of William Davis and Therese Lovell's representative and instruct the representatives to select a third representative within **ten (10) business days**. Representatives should be a professional engineer or hydrogeologist with experience in the field of groundwater hydrology. William Davis and Therese Lovell agrees to reimburse the members of the committee for reasonable time spent, at a rate prevailing in the area for experts in the above listed fields, and for direct costs incurred in administering the plan. The claimant may, at his or her option, choose to provide the reimbursement for the member of the committee selected by the claimant and up to half of the reimbursement for the mutual representative.

Within **ten (10) business days** of selection of the third representative, the committee will establish a **reasonable deadline** for submission of all documentation it needs to evaluate the claim. Both the claimant and the Owner will abide by this deadline.

Within **fifteen (15) business days** of receipt of documentation, the committee will evaluate the claim and reach a decision by majority vote. The committee will notify the claimant regarding its decision to (a) deny or (b) approve the claim. If the claim is approved, William Davis and Therese Lovell will mitigate the adverse impacts within **thirty (30) business days** of making the decision or as soon as practical. If the claim is denied by the committee, the Owner

may seek reimbursement from the claimant for the claimant's committee representative and one half of the 3rd representative on the committee.

If a claimant within the indicated area of impact indicates that they are out of water, William Davis and Therese Lovell will accept the responsibility of providing water for human consumptive needs within **seventy-two (72) hours** and to cover the claim review period. The Owner reserves the right to recover the cost of such emergency supply if the claim is denied by the Owner or found to be fraudulent or frivolous. If the Owner denies a claim and the claimant elects to proceed with the three (3) member committee, the Owner will continue the emergency water supply at the claimants' request during the committee's deliberations, but reserves the right to recover the total costs of emergency water supply in the case that the committee upholds the denial of the claim. Similarly, William Davis and Therese Lovell reserves the right to recover costs associated with the claim process if a claim is found to be fraudulent or frivolous.

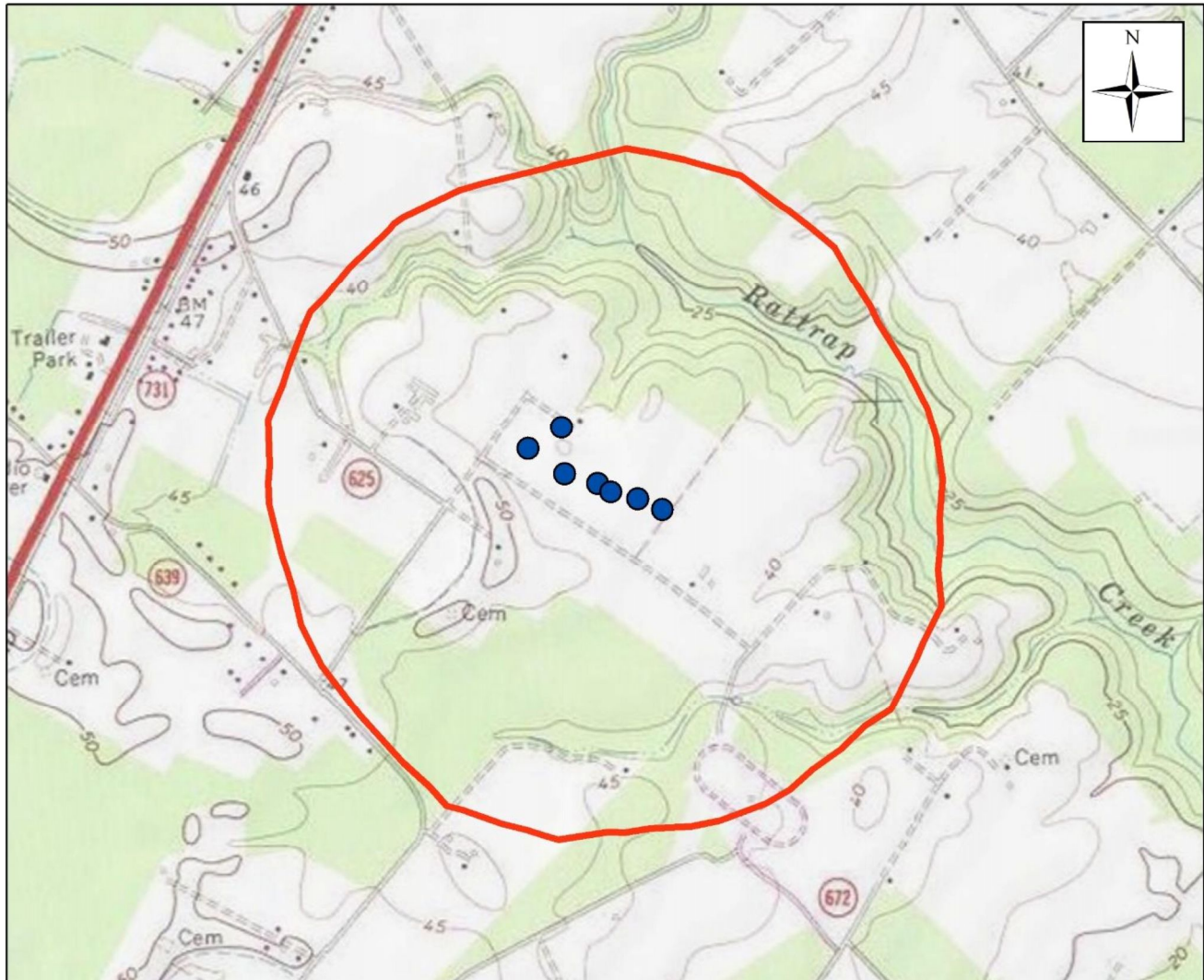
If it is determined by the committee or shown to the committee's satisfaction that a well operating under a mitigation plan similar to Old Mill Farms' Plan other than those owned and operated by William Davis and Therese Lovell has contributed to the claimed adverse impact, the Owners' share of the costs associated with mitigation will be allocated in proportion to its share of the impact. Such a determination shall be made by the committee after notification of the third party well owner, giving the third party well owner opportunity to participate in the proceedings of the committee.

PLAN ADMINISTRATION

Nothing in the Plan shall be construed to prevent the Department of Environmental Quality Staff from providing information needed for resolution of claims by the committee.

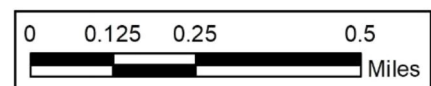
Old Mill Farm

Area of Impact - Upper Yorktown-Eastover Aquifer



● Old Mill Farm Wells

○ Upper Yorktown-Eastover Aquifer Area of Impact



Simulated drawdown at or exceeding one foot in the Upper Yorktown-Eastover aquifer resulting from a 12,000,000 gallon per year (32,876 average gpd), 50 year withdrawal from the Upper Yorktown-Eastover aquifer using the VAHydroGW-ES.

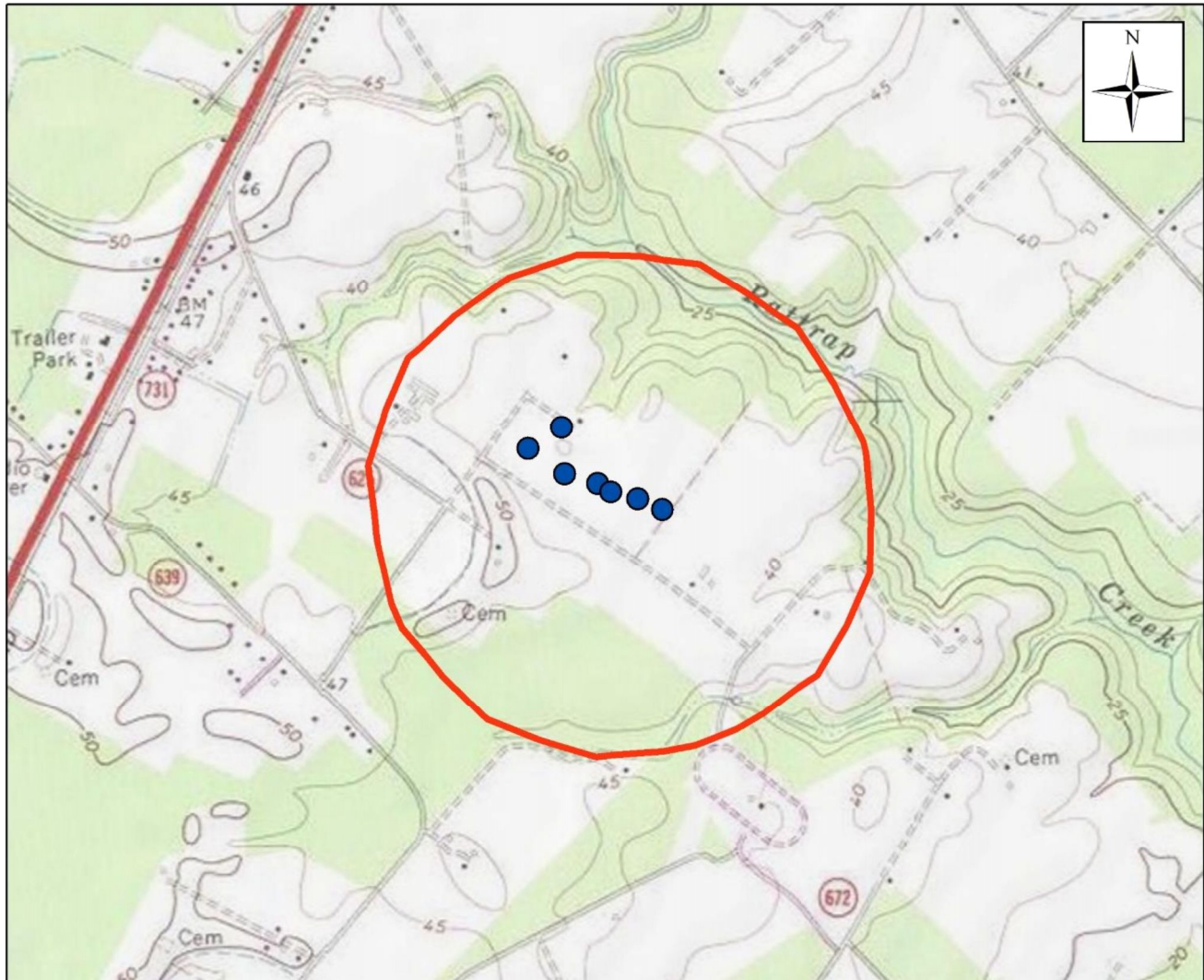
Maximum radius of one foot drawdown (Area of Impact) extends approximately 0.6 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018



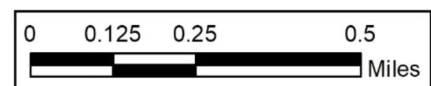
Old Mill Farm

Area of Impact - Middle Yorktown-Eastover Aquifer



● Old Mill Farm Wells

○ Middle Yorktown-Eastover Aquifer Area of Impact



Simulated drawdown at or exceeding one foot in the Middle Yorktown-Eastover aquifer resulting from a 12,000,000 gallon per year (32,876 average gpd), 50 year withdrawal from the Upper Yorktown-Eastover aquifer using the VAHydroGW-ES.

Maximum radius of one foot drawdown (Area of Impact) extends approximately 0.4 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018



Section #8

Old Mill Farms, Inc. Justification for the Amount of Withdrawal Requested

Last Updated 3-26-2018

Groundwater Withdrawal Permit Application GW0073100

Description and Documentation of Beneficial Use:

Old Mill Farms consists of 11 poultry houses. Seven wells bring water to five pump houses and then on to the poultry houses. Four (4) houses are 500 feet long and 40 feet wide and have 4 drinker lines which each run the length of the houses. Two (2) houses are 500 feet long by 42 feet wide. Two (2) houses are 500 feet long by 50 feet wide and have 6 drinker lines which each run the length of the houses. Water is introduced to these 8 houses through ¾" PVC. Specially designed PVC drinker lines carry the water to nipple drinkers for the birds. The 3 largest houses are 560 feet long and 61 feet wide and have 6 drinker lines which each run the length of the houses. Again, water is supplied to the houses through ¾" PVC lines and then routed to specially designed PVC drinker lines. Birds tap the steel balls in the nipple drinkers releasing a drop of water with each tap.

The 8 smaller poultry houses each have 75 feet up to 100 feet of 5' porous cardboard cool cell pads on both sides of one end of each house. Water is supplied to the cool cell pads via ¾" PVC lines. The largest 3 houses each have approximately 125 feet of 5' porous cardboard cool cell pads on both sides of one end of each house. Water is supplied to the cool cell pads via 1" PVC lines.

Water Demand Projections:

(4) 500'x40' houses	4 dr. lines	(2) 75'x5' cooling pads	8 (10) fans	22,700 birds
(2) 500'x42' houses	4 dr. lines	(2) 85'x5' cooling pads	10 (12) fans	23,800 birds
(2) 500'x50' houses	6 dr. lines	(2) 100'x5' cooling pads	11 (14) fans	28,200 birds
(3) 560'x61' houses	6 dr. lines	(2) 125'x5' cooling pads	16 (20) fans	38,400 birds

Perdue Farms, Inc, has recently switched to a breed of bird that requires more cooling. The company has strongly encouraged Old Mill Farms to add more fans in the houses. Thirty new 28,500 cu.ft. fans will be added in the near future. As shown in the table above, there are 4 houses @ 500 feet long by 40 feet wide with 4 drinker lines. Each house has 2 cooling pads 75 feet long by 5 feet tall and 8 fans and holds an average of 22,700 birds. The number of fans in parentheses (10) indicates the total number of fans after the upgrade. Reading the table, it can be discerned that there are 2 houses @ 500 feet long by 42 feet wide, 2 houses @ 500 feet long by 50 feet wide and 3 houses @ 560 feet long by 61 feet wide. The changes in number of fans for each house is indicated by the parentheses in each fan column.

The farm currently houses approximately 310,000 birds per flock. When the houses were built, they housed approximately 371,000 birds. Market demands have led to the drop in numbers. While the facility owner does not anticipate the average number of birds housed to go up again,

we have no control over it at this level. Increased capacity could greatly affect the figures supplied.

Consumption:

Complete records for Old Mill Farms were not available at the time of this permit request. Some meter records were inadvertently destroyed, not realizing they would be necessary for this process. In the best interest of getting the most accurate figures, we decided to use the formula supplied by DEQ to ascertain our needs. Since the poultry houses given on the example were listed as “8 poultry houses [5 houses @40 ft. width, 3 houses @ 50 ft. width],” it was assumed that the length of the houses was 500 ft. each. Calculating the square footage of the example houses, we come up with 175,000 sq. feet. Calculating Old Mill Farms house dimensions (all houses), we come up with 275,000 sq. feet.

$275,000 \text{ sq ft (actual)} / 175,000 \text{ sq ft (example)} = 1.57 \times 564,237 \text{ gal/flock (example)} = 885,852 \text{ gal/flock (actual)}$

Annual flock consumption = $885,852 \text{ gal/flock} \times 5.5 \text{ flocks/year} = \underline{4,872,186 \text{ gallons/year}}$

Birds consume more water as they grow, so consumed water at the beginning of the flock will be less than at the end. Weather also plays a big role in water consumption. Birds will drink more when the temperatures rise. Flocks raised in the summer months will consume more water overall than in months when the outside temperature is more tolerable. Figures used represent maximum monthly flock consumption.

Again using the example farm information given by the DEQ, we multiplied the example maximum monthly consumption by 1.57 to get the maximum monthly consumption for Old Mill Farms.

Maximum monthly flock consumption = $481,225 \text{ gal/mon (example)} \times 1.57 = \underline{755,523 \text{ gallons/month}}$

Cooling:

Evaporative cooling is used only when the outside temperature drives the interior temperatures above healthy levels for the birds. The older the birds are, the more critical it is to get temperatures inside the houses below the mid to upper 80's. The owner does not have access to exact water usage for cooling the houses at this time. We plan to add meters to determine usage in the near future. For the purposes of this application, we have calculated our numbers based on the Cobb Broiler Management Guide provided to us by the Department of Environment Quality. Since Old Mill Farms has houses of varying sizes, multiple calculations have been made to estimate water usage for cooling.

$\text{Tunnel fan capacity} = [228,000 \text{ cfm/hse} \times 4 \text{ houses}] + [285,000 \text{ cfm/hse} \times 2 \text{ houses}] + [313,500 \text{ cfm/hse} \times 2 \text{ houses}] + [456,000 \text{ cfm/hse} \times 3 \text{ houses}] = 3,477,000 \text{ cfm}$

Annual cooling = 3,477,000 cfm x 1.6 gal/year/cfm = 5,563,200 gal/year

Perdue Farms, Inc. has recently switched to a breed of bird that requires more cooling. The company has strongly encouraged the farm owner to add more tunnel fans. Thirty additional fans will be added in the near future at 28,500 cubic feet per minute each.

Additional fans = 28,500 cfm x 30 fans = 855,000 cfm

Additional annual cooling = 855,000 cfm x 1.60 = 1,368,000 gal/year

Total annual cooling = 5,563,200 gal/year + 1,368,000 gal/year = 6,931,200 gal/year

To determine the maximum monthly amount for cooling, we divided the maximum annual amount for cooling by 3 to provide flexibility.

Monthly cooling = 6,931,200 gal/year divided by 3 = 2,310,400 max gal/month

Other Water Usage:

A smaller amount of water is used in the operation of the farm. Water is used to wash equipment, manage facilities and occasionally to irrigate the trees on the farm. No meter readings are available for this other usage. The owner estimates other usage of water to be around 100,000 gal/year.

Estimated other usage annually = 100,000 gal/year

The houses are cleaned between flocks and equipment is washed with a pressure washer. Since the flocks are out approximately 5.5 times per year, monthly calculation is also an estimate. The estimated other monthly usage was divided by 3 to allow for seasonal variation.

Estimated other usage monthly = 100,000 gal/year divided by 3 = 33,333 gal/month

Requested Withdrawal Amounts:

Annual amount = 4,872,186 gal/year (consumption) + 6,931,200 gal/year (cooling) + 100,000 gal/year (other usage) = 11,903,386 gal/year

12,000,000 gal/year (rounded up to the nearest hundred thousand)

Maximum monthly amount = 755,523 gal/mon (consumption) + 2,310,400 gal/mon (cooling) + 33,333 gal/mon (other usage) = 3,099,256 gal/mon

3,100,000 gal/mon (rounded up to the nearest hundred thousand)

Apportionment of Withdrawal to Individual Wells:

Well locations, meter locations are indicated on the attached drawing marked "8A." No surface water is used in the facility and no waste water is generated. Each well provides water for consumption and cooling to the indicated houses.

This facility does not currently have meters on each well. Only drinker lines in each chicken house are currently metered. The owner plans to add meters to each well in the near future. The line drawing shows how water flows from wells to houses.

Well OMF 1 (DEQ 100-001383) flows into pump house A and is pumped into chicken houses 2 and 3 (each house 500ft x 40ft). Well OMF2 (DEQ 100-001384) flows into pump house A and is pumped to chicken houses 1 and 4 (each house 500ft x 40ft).

Well TAM3 (DEQ 100-001385) flows into pump house B and is pumped into chicken houses 6 and 7 (each house 500ft x 42ft). Well TAM4 (DEQ 100-001386) flows into pump house B and is pumped to chicken houses 8 and 9 (each house 500ft x 50ft).

Well TAM5 (DEQ 100-001387) flows into a pump room on house 10 and supplies water for that house. Well TAM6 (DEQ 100-001388) flows into a pump room on house 11 and supplies water for that house (each house 560ft x 61ft).

Well OMF7 (DEQ 100-001389) flows into a pump room on chicken house 5 and supplies water for that house (560ft x 61ft).

All wells operate daily and provide water for consumption and for cooling. Wells connected to larger houses provide a larger portion of water usage. Wells connected to smaller houses provide a smaller portion of water usage. Pumping volume for each well will be ascertained when meters are placed on them in the near future.

Well construction data is attached and noted as "Section 13." All information was provided by Bundick Well and Pump, Inc. 35162 Lankford Highway, Painter, VA 23420.

Agricultural Water Supply Information:

Groundwater is used for livestock watering of domestic chickens. This facility raises broiler chickens and contracts through Perdue Farms, Inc. The breed of bird housed may vary in accordance with Perdue Farms, Inc. specifications. Birds are brought to the facility at less than one day old and are raised for approximately seven weeks. The birds weight about an average of seven pounds at that time and are captured live by a specialized crew and transported to the Perdue facility for processing. The chickens are both male and female, but do not produce eggs before transport to the processing facility. Birds are fed a special grain diet provided by Perdue Farms, Inc. consisting of primarily corn and soybeans. Birds consume on average a little less than 2 pounds of grain per pound of bird weight. The chickens are free to roam on a litter (wood shavings) floor inside the houses. They are more active when the lights are on. A strict lighting program is employed to ensure the birds get enough exercise to be healthy, but have adequate

time for rest. The water may be treated with a pH reducer for bird health and chlorine to help cleanse the lines. Air temperature varies from 93 degrees at bird level when they are one day old, to 65 degrees at time of transport to the processing facility.

Item #10

Old Mill Farms, Inc. Water Conservation Management Plan

Last Updated 3-26-2018 & 6-14-18 (GWP # corrected)

Groundwater Withdrawal Permit Application GW0073000

Facility Site Address: 20503 Kendallworth Drive, Melfa, VA

Mailing Address: 1 Mount Prospect Avenue, Onancock, VA 23417

Owner: William Davis (Dave) Lovell and Therese (Tracy) Lovell

Site Contact: Tracy Lovell Phone: 757-710-8264

General Overview and System Information:

Old Mill Farms, Inc. is a poultry farm located in Accomack County, Virginia. The farm has been in operation since 1991 and consists of 22 acres with 11 chicken houses, which hold an average of 310,000 live birds. The water is supplied by seven (7) wells located on the property. Every effort is made to conserve water usage and to reduce run-off. The operation seeks to ensure the health and well-being of the birds while remaining environmentally conscious.

Ground water is drawn through the seven deep wells on the property and routed through five (5) pump houses before being delivered to 11 poultry houses. Water is supplied for consumption by the birds through drinker lines. The birds tap drinker nipples with their beaks and a drop of water comes out. This reduces spillage. Lines are monitored for pressure and possible leaks several times a day and adjusted as the birds grow to ensure minimal leaks and bird health.

Water is also used to cool the birds through evaporative cooling. Lines are run to recirculating five foot tall porous cardboard cool cell pads, which vary in length in accordance with house sizes from 75 feet to 125 feet, on each side of one end of each chicken house. Temperature sensors from several places inside the houses send readings to the controller to indicate the need for cooling. The operator sets the automatic controller to initiate the cooling pads to temperatures which are determined by integrator guidelines and weather, usually in the mid to upper 80's. When conditions determine that cooling pads are necessary, water which has been stored in the sump at the base of the pads is trickled over the top of the cool cell pads. A float valve in the sump automatically draws water from the ground water lines when the water level in the sump drops below functional levels through evaporation. All cells are engaged simultaneously. Evaporative cooling is achieved as air is drawn through the pads by fans at the far end of the house. When the desired cooling has been achieved, the trickle valve is turned off automatically. Any water that is not evaporated in the cool cell pads makes its way down to the sump and is captured for future use. There is virtually no waste of water. Cooling pads are visually inspected daily and cooling equipment is examined for possible wear and optimal function before cooling season begins.

A small amount of water is used in the composting process of daily mortality. In addition, water is sometimes used to clean the houses between flocks, to wash equipment, facilities management and occasional irrigation of trees on the property. A large portion of dust cleaning is done with pressurized air, but a small portion of the cleaning requires high pressure washing. Care is taken by personnel to ensure that water is used in limited amounts. There is no wastewater treatment on site. Excess water is absorbed into the ground and recycled into the water table.

Section 1: Water Savings Equipment and Processes:

The poultry houses are not all the same size. The smallest houses are 500 feet x 40 feet and have 4 drinker lines that run the length of the houses. The largest houses are 560 feet x 61 feet and have 6 drinker lines that run the length of the houses. All drinker lines have nipple drinkers all along the lines and clear stand pipes at several intervals to monitor pressure. Water pressure is monitored by personnel several times a day by visually inspecting the stand pipes and testing the nipples. Pressure is changed to accommodate the growing birds. Water consumption is also affected by weather. During warm weather, the birds require more water for consumption and for evaporative cooling as indicated in the previous section.

Section 2: Water Loss Reduction Program:

Personnel visually inspect the entire facility several times a day and water consumption by birds is recorded each day based on meter readings. This allows for prompt response in the event of water leaks. Personnel assess the situation, stop the flow of water where appropriate, and repair any broken equipment. All couplers and pipes above ground are visually inspected in the course of daily walk-throughs. Any potential problems are noted or repaired immediately. All water lines are PVC pipe. Approximately 25% of piping is buried. The property surrounding the chicken houses is inspected in the course of daily operation. Any unexpected puddles are investigated promptly. Inside the houses, water lines are inspected several times a day in the course of normal operations. In addition, water lines, drinker lines, evaporative cooling system and all equipment is closely inspected after the flocks leave for possible damage from live-haul crews. Any damaged equipment is repaired. The evaporative cooling system recycles water through the cool cell pads. Any water that is not evaporated in the cool cell pads makes its way down to the sump and is captured for future use. There is virtually no waste of water.

The facility owner plans to add water meters that will monitor total usage of each well in the near future. In the course of preparing regular reports to the DEQ, water usage will be monitored and evaluated. Any leaks will appear as anomalous increases and will be investigated.

Section 3: Water Use Education Programs:

As new personnel are added to the facility, the manager and owner provide on-the-job training. New employees are instructed how to inspect drinker lines, stand pipes, evaporative cooling system and spigots. Employees understand that excessive moisture inside the chicken houses adversely affects the health of the birds, and ensure that any moisture problems are addressed promptly. Periodically, as the birds grow or as the weather changes, the water requirements of

the animals change. Personnel are instructed how to make changes to water pressure and program computers within the chicken houses. Occasionally, Perdue Farms, Inc. will instruct farm owners on changes to industry standards for bird care. Sometimes this includes water usage. As the owner is apprised of changes in water requirements, personnel are also instructed. These changes do not happen on a regular basis, so a regular training schedule is unnecessary.

Section 4: Evaluation of Potential Water Reuse Options:

The floors inside the chicken houses are bare dirt lined with wood sawdust and chips, called "litter." The birds are free to roam on the litter floors. Any excess water is absorbed by the litter. After the flock is taken away, the wet litter is removed and used in the composting process or by a local farmer for fertilizer. If a leak should occur within the chicken houses, the affected litter is removed and stored. As needed, the wet litter will be used in composting process. If a leak is large enough to soak through the depth of the litter, the dirt floor will absorb it and it will eventually re enter the water table. Heaters will be employed to dry the floor before chickens are reintroduced to the area. There is no feasible option to recapture leaked water in the houses.

Section 5: Water Use Reductions During Drought or Water Use Emergencies:

If the local governing body or the director of DEQ declares mandatory water use restrictions during water shortage emergencies, the farm will comply with restrictions imposed.

Section 6: Water Use Restrictions During Drought or Water Use Emergencies:

In the event of a water emergency or drought, the facility owner would consult with veterinarians on staff at Perdue Farms, Inc. to determine the minimum amount of water the birds could drink without affecting their health. In addition, farm management may be able to increase ventilation and reduce the use of evaporative cooling during the restriction period. If necessary, water use for cleaning can be reduced in the short term, although it would not be a long term solution.

Conclusion:

Old Mill Farms, Inc. is committed to reducing any negative impact poultry farming may have on the environment. The owner employs best management practices including vegetative buffers throughout the facility and concrete pads at the large door openings on all houses. Dave Lovell, the owner, serves on the Board of the Eastern Shore Soil and Water Conservation District and endeavors to be aware of current environmental impact concerns and suggested impact reducers. Dave received the 2016 Water Guardian award from the Eastern Shore of Virginia Water Keeper for his work in bridging the relationship between the poultry community and the environmental community. Dave serves on Delmarva Poultry Industry Inc. environmental committee as well.

**COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY**

TECHNICAL EVALUATION FOR PROPOSED GROUNDWATER WITHDRAWAL

Date: December 14, 2018

Owner / Applicant Name: William Davis Lovell and Therese B. Lovell

Facility / System Name: Old Mill Farm

Facility Type: Agriculture – Poultry Farm

Facility Type: Agriculture – Poultry Farm

Facility / System Location: Accomack County

The Commonwealth of Virginia’s Groundwater Withdrawal Regulations (9VAC25-610-110(D)) state that, for a permit to be issued for a new withdrawal, to expand an existing withdrawal, or reapply for a current withdrawal, a technical evaluation shall be conducted. This report documents the results of the technical evaluation conducted to meet the requirements for the issuance of a permit to withdrawal groundwater within a Groundwater Management Area as defined in (9VAC25-600-10 et seq.).

This evaluation determines the:

- (1) The Area of Impact (AOI): The AOI for an aquifer is the areal extent of each aquifer where one foot or more of drawdown is predicted to occur as a result of the proposed withdrawal.
- (2) Water Quality: The potential for the proposed withdrawal to cause salt water intrusion into any portions of any aquifers or the movement of waters of lower quality to areas where such movement would result in adverse impacts on existing groundwater users or the groundwater resource as per (9VAC25-610-110(D)(2), and
- (3) The Eighty Percent Drawdown (80% Drawdown): The proposed withdrawal in combination with all existing lawful withdrawals will not lower water levels, in any confined aquifer that the withdrawal impacts, below a point that represents 80% of the distance between the land surface and the top of the aquifer at the points where the one-foot drawdown contour is predicted for the proposed withdrawal as per 9VAC25-610-110(D)(3)(h).

Summary of Requested Withdrawal:

General:

In response to the Department of Environmental Quality’s (DEQ) Compliance Assistance Framework initiative, a cohort of poultry farms in Accomack County were identified as potentially requiring a groundwater withdrawal permit (GWWP). The farms primarily grow broilers which are processed by several poultry integrators located in the area. These farms use groundwater to provide drinking water to the birds as well as to supply water to either misting systems or evaporative cooling pads which cool the birds. Cooling is primarily required in summer. Most wells associated with poultry farms in Accomack County are screened in either the upper, middle, or lower Yorktown-Eastover aquifers. The use of the Columbia (water-table) aquifer is being investigated by the industry and this aquifer may be used in the future to augment withdrawals from confined aquifers where possible.

Water use for poultry farms varies seasonally as well as in response to the poultry life cycle. Generally during winter, fall, and spring, facility withdrawals rise and fall in a fairly predictable pattern every 50-60 days, with usage primarily resulting from water consumption. This pattern starts with low water

consumption volumes for chick development and maxes out in the last 20-30 days as breeders seek to maximize adult weight gains. Typically, farms raise around five flocks per year with this cycle repeating each time. During the summer, withdrawal volumes increase due to additional water usage for flock cooling purposes. A few farms have additional sanitary and other agricultural uses (crops/other livestock).

Facility Specific:

Old Mill Farm has eleven poultry houses and seven production wells. Four (4) houses are 500 feet long and 40 feet wide and have 4 drinker lines which each run the length of the houses. Two (2) houses are 500 feet long by 42 feet wide and have 4 drinker lines which each run the length of the houses. Two (2) houses are 500 feet long by 50 feet wide and have 6 drinker lines which each run the length of the houses. Two (2) houses are 560 feet long by 61 feet wide and have 6 drinker lines which each run the length of the house. Proposed withdrawal limits were calculated based on the total of both consumption (drinking water) and cooling. Water use for consumption was calculated based on comparable farm information. Water use for cooling was calculated based on estimates based on house size and cooling fan capacity.

A small amount of water is used for general farm operation including washing equipment, cleaning houses between flocks, and occasional tree irrigation. An amount of 100,000 g/y was estimated for these uses.

The proposed withdrawal limits, well apportionment, and well construction details are as follows:

Proposed Withdrawal Limits:

Proposed Withdrawal Limits	
Annual Value	12,000,000 (32,877 average gpd)
Monthly Value	3,100,000 (100,000 average gpd)

Due to the well and plumbing configuration, the withdrawal will be apportioned fairly equally between the system wells.

Production Well(s):

Identification	Location	Construction	Pump Intake	Source Aquifer
Owner Well Name: OMF1 DEQ Well Number: 100-001383 MPID: 373954075430201	Lat: 37° 39' 54.3954" Lon: 75° 43' 2.6364" Datum: WGS84 Elevation: 43	Completion Date: 11/25/1991 Screens (ft-bls): 175-190 Total Depth (ft-bls): 190	Not Determined	Upper Yorktown- Eastover
Owner Well Name: OMF2 DEQ Well Number: 100-001384 MPID: 373956075430602	Lat: 37° 39' 56.628" Lon: 75° 43' 6.5424" Datum: WGS84 Elevation: 43	Completion Date: 1/07/1997 Screens (ft-bls): 170-190 Total Depth (ft-bls): 190	Not Determined	Upper Yorktown- Eastover

Owner Well Name: TAM3	Lat: 37° 39' 53.5284" Lon: 75° 42' 59.075"	Completion Date: 8/03/2000	Not Determined	Upper Yorktown- Eastover
DEQ Well Number: 100-001385	Datum: WGS84 Elevation: 43	Screens (ft-bls): 170-190		
MPID: 373953075425903		Total Depth (ft- bls): 190		
Owner Well Name: TAM4	Lat: 37° 39' 52.7904" Lon: 75° 42' 57.69"	Completion Date: 2/24/2003	Not Determined	Upper Yorktown- Eastover
DEQ Well Number: 100-001386	Datum: WGS84 Elevation: 43	Screens (ft-bls): 180-200		
MPID: 373952075425704		Total Depth (ft- bls): 200		
Owner Well Name: TAM5	Lat: 37° 39' 52.182" Lon: 75° 42' 54.784"	Completion Date: 3/24/2010	Not Determined	Upper Yorktown- Eastover
DEQ Well Number: 100-001387	Datum: WGS84 Elevation: 43	Screens (ft-bls): 175-195		
MPID: 373952075425405		Total Depth (ft- bls): 195		
Owner Well Name: TAM6	Lat: 37° 39' 51.2424" Lon: 75° 42' 52.132"	Completion Date: 11/05/2010	Not Determined	Upper Yorktown- Eastover
DEQ Well Number: 100-001388	Datum: WGS84 Elevation: 43	Screens (ft-bls): 175-195		
MPID: 373951075425206		Total Depth (ft- bls): 195		
Owner Well Name: OMF7	Lat: 37° 39' 58.4166" Lon: 75° 43' 2.874"	Completion Date: 1/13/2010	Not Determined	Upper Yorktown- Eastover
DEQ Well Number: 100-001389	Datum: WGS84 Elevation: 43	Screens (ft-bls): 175-195		
MPID: 373958075430207		Total Depth (ft- bls): 195		

Geologic Setting:

The Old Mill Farm wells (applicant wells) are located in southern Accomack County. The production wells are screened in the Upper Yorktown-Eastover aquifer. The upper portion of the Yorktown-Eastover aquifer (described in the 2006 Virginia Coastal Plain Hydrologic Framework¹ (VCPHF) as a combination of the Upper, Middle, and Lower Yorktown-Eastover aquifers) is composed primarily of estuarine to marine quartz

¹ McFarland, E.R., and Bruce, T.S., 2006, The Virginia Coastal Plain Hydrogeologic Framework: U.S. Geological Survey Professional Paper 1731, 118 p., 25 pls.

sands of the Yorktown Formation of Pliocene age. The nearest USGS geologic cross section found in USGS Professional Paper 1731 is cross-section GS-GS' (see attached figure at the end of the report).

Virginia Eastern Shore Model data:

The following table lists the location of the applicant production wells within the Virginia Eastern Shore Model² (VAHydroGW-ES).

VAHydroGW-ES Model Grid				
Well	Well Number	MPID	Row	Column
OMF1	100-01383	373954075430201	154	47
OMF2	100-01384	373956075430602	154	47
TAM3	100-01385	373953075425903	154	48
TAM4	100-01386	373952075425704	154	48
TAM5	100-01387	373952075425405	154	48
TAM6	100-01388	373951075425206	154	48
OMF7	100-01389	373958075430207	153	47

Hydrologic Framework:

Data from the VCPHF is reported in this technical report to illustrate the hydrogeologic characteristics of the aquifers in the Virginia Eastern Shore near the applicant wells and identify major discrepancies between regional hydrogeology and site logs interpreted by the DEQ staff geologist.

The following average aquifer elevations were estimated from the VAHydroGW-ES at the model cell(s) containing the applicant production wells.

VAHydroGW-ES Average Hydrologic Unit Information		
Aquifer	Elevation (feet msl)	Depth (feet bls)
Surface	43	0
Columbia aquifer (bottom)	-22	64
Upper Yorktown-Eastover aquifer (top)	-89	131
Upper Yorktown-Eastover aquifer (bottom)	-136	178
Middle Yorktown-Eastover aquifer (top)	-157	199
Middle Yorktown-Eastover aquifer (bottom)	-204	247
Lower Yorktown-Eastover aquifer (top)	-232	275
Lower Yorktown-Eastover aquifer (bottom)	-301	343

Eastern Shore Hydrogeologic Framework Based Recommendations:

Due to a lack of geophysical borehole data, DEQ staff has reviewed available information and made the following preliminary determinations regarding the location of the aquifer tops for the following wells based upon a review of the GW-2 forms available and The Virginia Coastal Plain Hydrogeologic Framework (USGS Professional Paper 1731). Further evaluation of aquifer tops will be conducted during the upcoming permit term and as additional geophysical information becomes available.

² Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009-5066, 125 p.

Unit	OMF1 (ft-bls)	OMF2	TAM3	TAM4	TAM5	TAM6	OMF7
Top of the Upper Yorktown-Eastover	132	132	132	132	132	132	132
Top of the Middle Yorktown-Eastover	199	199	199	199	199	199	199
Top of the Lower Yorktown-Eastover	274	274	274	274	274	274	274

Water Level Comparison:

Below water levels retrieved from the USGS regional observation network wells are compared to the simulated water levels reported in the *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report (the 2017-2018 report) and simulation files.³ This comparison is made in order to evaluate the performance of the regional model in the vicinity of the applicant wells and assess historical groundwater trends.

The 2017-2018 report provides two sets of simulated potentiometric water surface elevations. The VAHydroGW-ES model is divided into three parts. The first portion of the model simulates water levels within the Eastern Shore aquifers from 1900 through 2017 based upon historically reported pumping amounts (the “*Historic Use Simulation*”). This portion of the model has been calibrated to match water levels observed in USGS regional observation network wells situated throughout the peninsula. The water levels reported in the 2017-2018 report are based upon two separate simulations, each simulation running from 2018 through 2067. The simulated pumping amount in these two simulations are based upon, 1) the average 2013-2017 reported withdrawal amount of wells in the VAHydroGW-ES model (the “*Reported Use Simulation*”) and, 2) the current (2018) maximum withdrawal amount allowed under their current permit for wells in the VAHydroGW-ES model (the “*Total Permitted Simulation*”). Both these simulations are an extension of the *Historic Use Simulation* and the water levels reported in the 2017-2018 report are the final water levels simulated at the end of the simulations (2067).

The “VAHydroGW-ES 2067 Reported Use Water Level,” reported in the tables below, is the simulated water level – 50 years from present – if all permitted pumping continued at the average 2013-2017 reported withdrawal amount for the next 50 years. And the “VAHydroGW-ES 2067 Total Permitted Water Level,” reported in the tables below, is the simulated water level – 50 years from present – if all Eastern Shore permitted wells were to pump at the maximum permitted amount allowed under their current permit for the next 50 years. Finally, the “VAHydroGW-ES 2017 Historic Use Water Level,” reported in the tables below, is the water level simulated for the year 2017 in the *Historic Use Simulation*.

The nearest USGS regional observation network wells to the applicant wells, completed in the Upper, Middle, or Lower Yorktown-Eastover aquifers, are listed in the following tables and shown in Figure 1. For the USGS regional observation network wells, average 2017 reported water levels are shown in the following tables. Simulated water levels for the Upper, Middle, and Lower Yorktown-Eastover aquifers, for the VAHydroGW-ES cells containing the USGS regional observation network wells are also shown in the following tables.

³ See *Virginia Eastern Shore 2017-2018 Annual Simulation of Potentiometric Groundwater Surface Elevations of Reported and Total Permitted Use* report and simulation files on file with the VA DEQ.

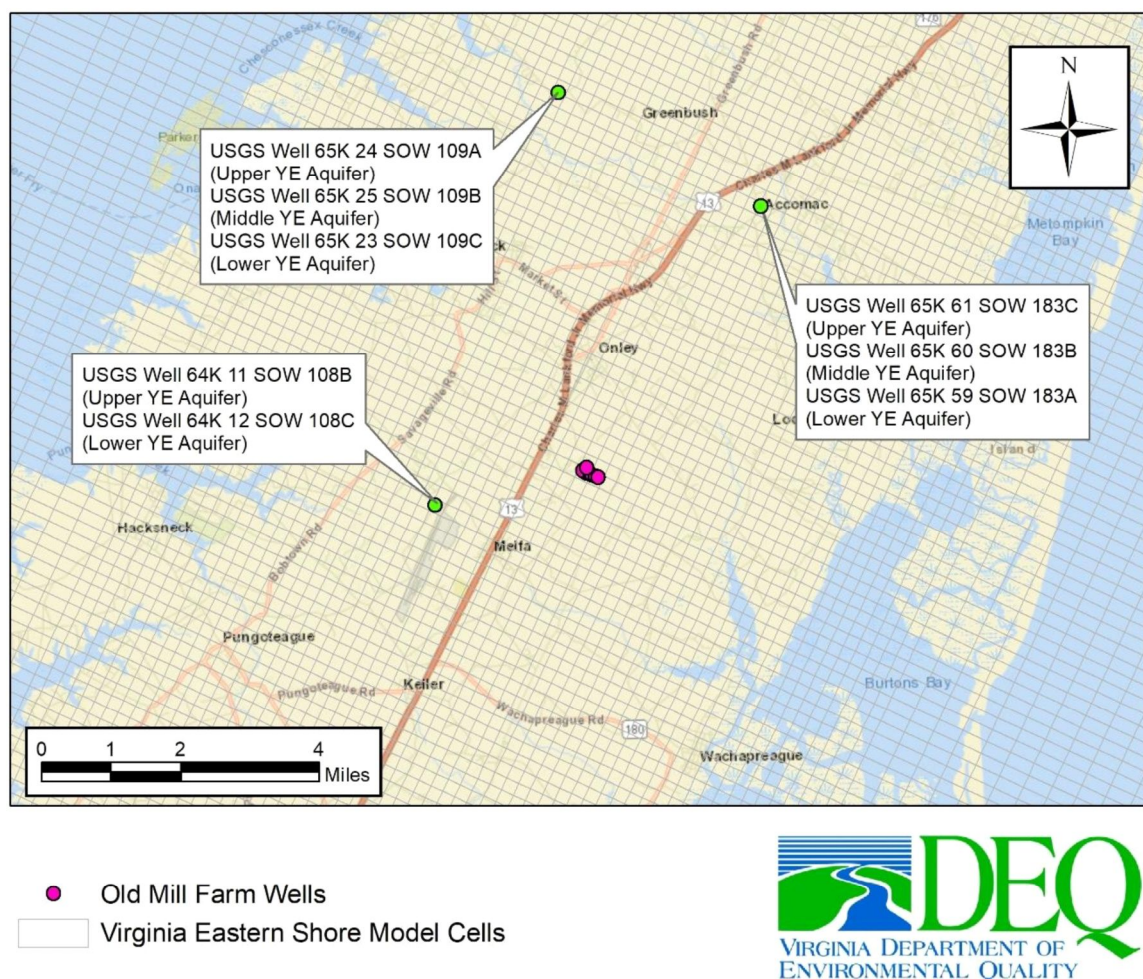


Figure 1. Nearest USGS regional observation network wells.

Comparing the VAHydroGW-ES 2017 Historic Use Water Level with the USGS Network Well 2017 Water Level provides a method for judging the accuracy of the VAHydroGW-ES. Figures 2 through 9 show graphs of the recorded water levels from the USGS observation wells listed in the following tables. These figures also show the simulated VAHydroGW-ES *Historic Use Simulation* water levels for the model cell containing each USGS well. Observing the simulated and observed water elevations together provide a second method for assessing the accuracy of the VAHydroGW-ES in the vicinity of the applicant wells.

The Upper Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Level is essentially the same value as the USGS Network Well 2017 Water Level observed in Well 65K 24 SOW 109A. The 2017 VAHydroGW-ES water level is 4 feet lower than the level observed in Well 64K 11 SOW 108B and 7 feet lower than the level observed in Well 65K 61 SOW 183C. The water levels observed over the past approximately 40 years in each Upper Yorktown-Eastover USGS well are shown in Figures 2 through 4. The wells exhibit yearly fluctuations in water levels of approximately 2 to 5 feet. Water levels simulated by the VAHydroGW-ES do not fluctuate in the same manner because the pumping and recharge simulated in the model for any given year are averaged over the year and entered in the model as the average value for the year. Water levels for the USGS Upper Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES – especially for Well 65K 24 SOW 109A. While still reasonably accurate, water levels are approximately 3 feet higher for Well 64K 11 SOW 108B and approximately 5 feet higher for Well 65K 61 SOW 183C, over the three to four decades, when compared to those simulated by the VAHydroGW-ES.

The Middle Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Levels are 5 feet higher to 8 feet lower than the USGS Network Well 2017 Water Levels observed in Well 65K 25 SOW 109B and Well 65K 60 SOW 183B. The water levels observed over the past 30 to 40 years in the Middle Yorktown-Eastover USGS wells are shown in Figures 5 and 6. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Middle Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES. Water levels for Well 65K 25 SOW 109B are higher by approximately 5 feet than those simulated by the VAHydroGW-ES over the past 40 years. The fluctuations and general patterns observed in Well 65K 60 SOW 183B are generally simulated by the VAHydroGW-ES. The large spike in the simulated water level at the end of 2012 (observed in Well 65K 60 SOW 183B) is due to a significant reduction in reported pumping for the year 2012 by a large, nearby withdrawal. The absence of a corresponding jump in water levels in the USGS observation wells indicates that the reported pumping amounts for the year 2012 may not have matched the actual pumping in the vicinity of the well.

The Lower Yorktown-Eastover VAHydroGW-ES 2017 Reported Use Water Level is approximately 3 feet lower than the USGS Network Well 2017 Water Level observed in Well 65K 59 SOW 183A; the VAHydroGW-ES 2017 value for USGS Well 65K 23 SOW 109C is approximately 2 feet higher; and the 2017 VAHydroGW-ES water level is approximately 8 feet higher than the level observed in Well 64K 12 SOW 108C. The water levels observed over the past 30 to 40 years in the Lower Yorktown-Eastover USGS wells are shown in Figures 7 through 9. Each well exhibits yearly fluctuations in water levels of approximately 2 to 10 feet. Water levels for the USGS Lower Yorktown-Eastover wells are in general agreement with the water levels simulated by the VAHydroGW-ES. The fluctuations and general patterns observed in Well 65K 23 SOW 109C and Well 65K 59 SOW 183A are generally simulated by the VAHydroGW-ES. Water levels simulated by the VAHydroGW-ES are also in general agreement with those observed in Well 64K 21 SOW 108C – though the observed water levels do decline at a larger rate than those simulated. The same spike outlined in the preceding paragraph is also visible in Well 65K 23 SOW 109C and Well 65K 59 SOW 183A.

Differences between observed and simulated water levels will be noted and addressed during the next calibration of the VAHydroGW-ES.

Upper Yorktown-Eastover Measurements	65K 24 SOW 109A	65K 61 SOW 183C	64K 11 SOW 108B
Distance from applicant wells (miles)	5.5	4.6	2.3
VAHydroGW-ES Row	128	130	161
VAHydroGW-ES Column	33	51	38
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	39	44
USGS Well Land Surface Elevation (ft-msl)	12	35	47
USGS Network Well 2017 Water Level (ft-msl)	5.8	15.4	33.5
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	5.7	8.3	29.4
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	5.6	8	29.3
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	4.3	4.8	28.3

Middle Yorktown-Eastover Measurements	65K 25 SOW 109B	65K 60 SOW 183B
Distance from applicant wells (miles)	5.5	4.6
VAHydroGW-ES Row	128	130
VAHydroGW-ES Column	33	51
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	39
Land Surface Elevation (ft-msl)	12	35
USGS Network Well 2017 Water Level (ft-msl)	0.2	10.4
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	5.3	2.9
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	5.2	2.1
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	3.9	-1.7

Lower Yorktown-Eastover Measurements	65K 23 SOW 109C	65K 59 SOW 183A	64K 12 SOW 108C
Distance from applicant wells (miles)	5.5	4.6	2.3
VAHydroGW-ES Row	128	130	161
VAHydroGW-ES Column	33	51	38
VAHydroGW-ES Land Surface Elevation (ft-msl)	13	39	44
Land Surface Elevation (ft-msl)	13	35	47
USGS Network Well 2017 Water Level (ft-msl)	-0.3	-17	12.9
VAHydroGW-ES 2017 Reported Use Water Level (ft-msl)	1.8	-20.4	20.8
VAHydroGW-ES 2067 Reported Use Water Level (ft-msl)	1.5	-20.7	20.6
VAHydroGW-ES 2067 Total Permitted Water Level (ft-msl)	0.1	-20.1	18.9

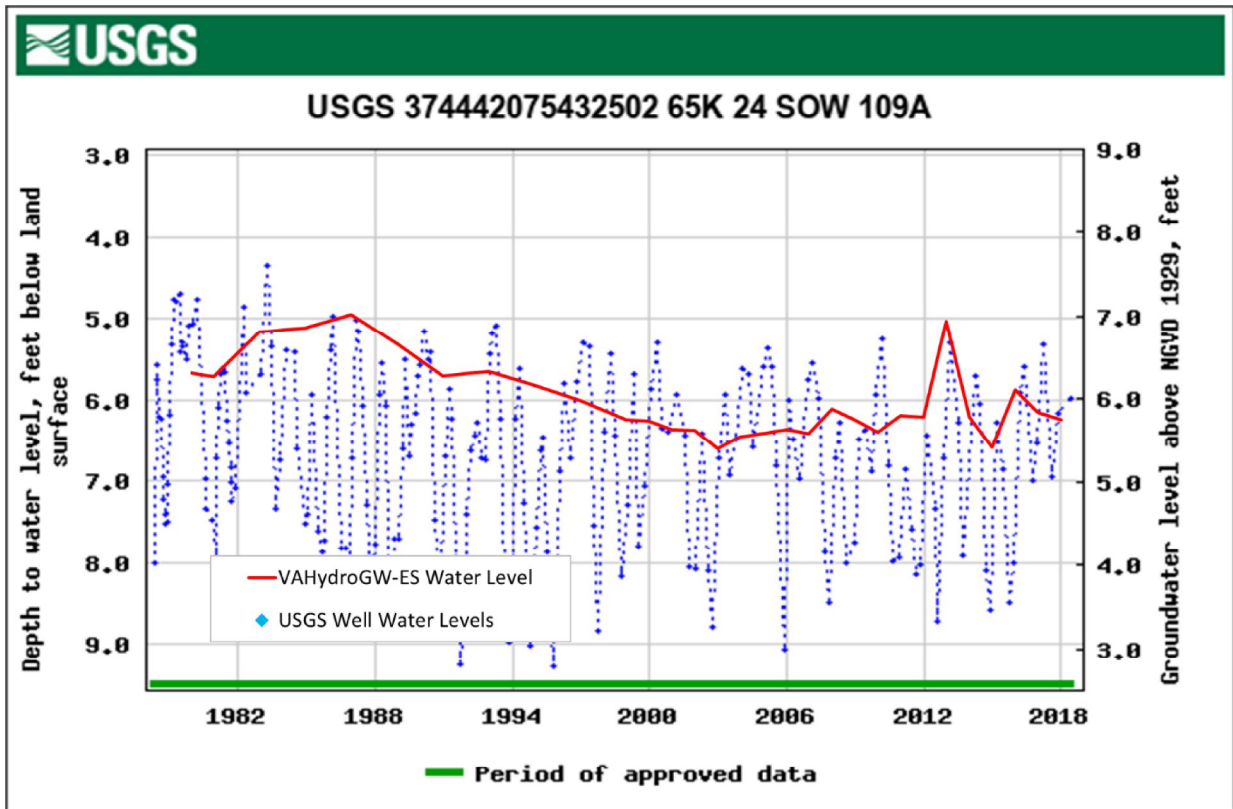


Figure 2. USGS Regional Observation Well 65K 24 SOW 109A, Upper Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 130 ft bls, land surface 12 ft msl).

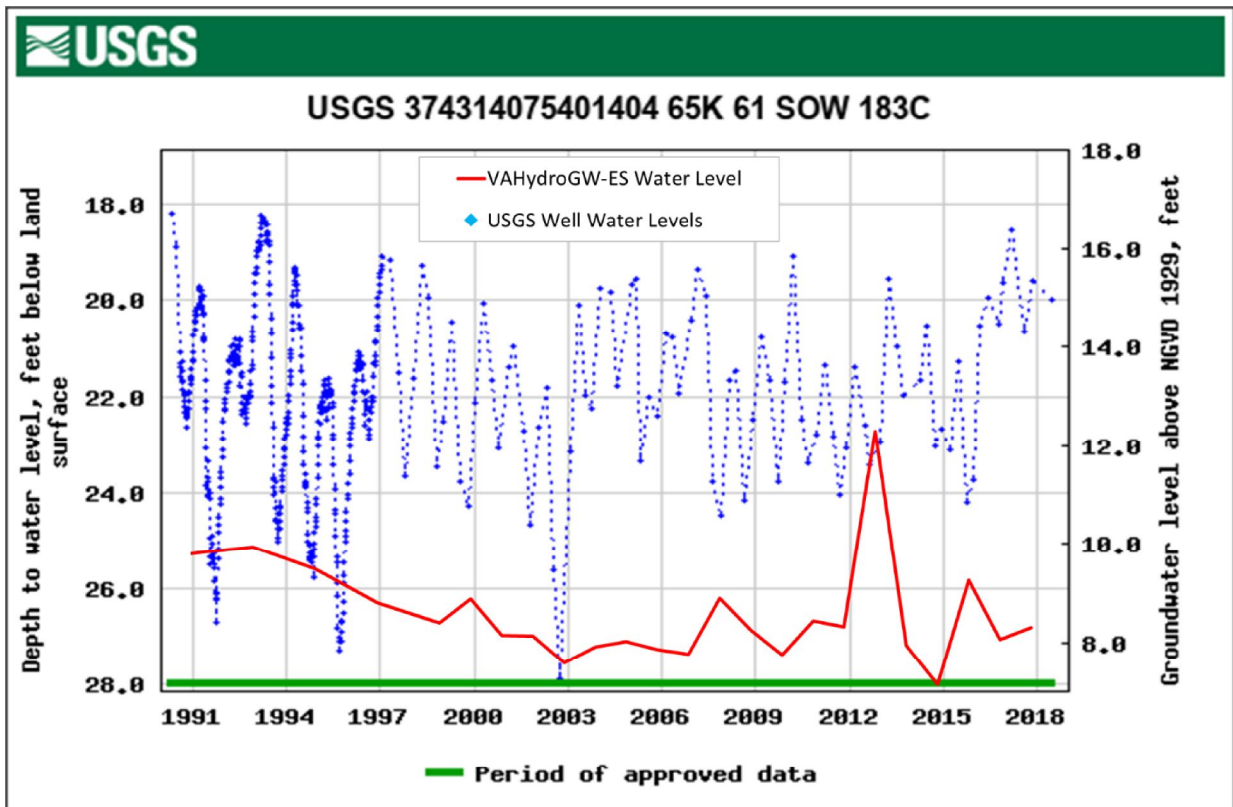


Figure 3. USGS Regional Observation Well 65K 61 SOW 183C, Upper Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 135 ft bls, land surface 35 ft msl).

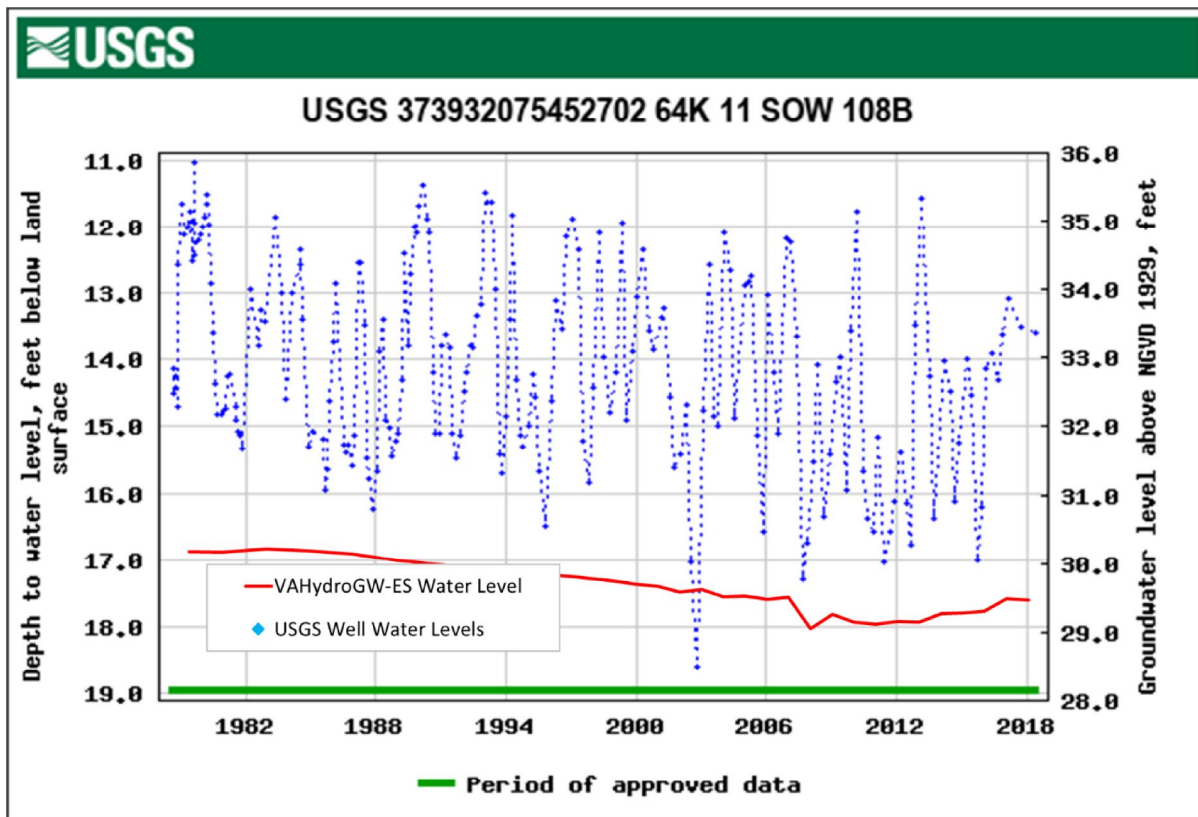


Figure 4. USGS Regional Observation Well 64K 11 SOW 108B, Upper Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 180 ft bls, land surface 47 ft msl).

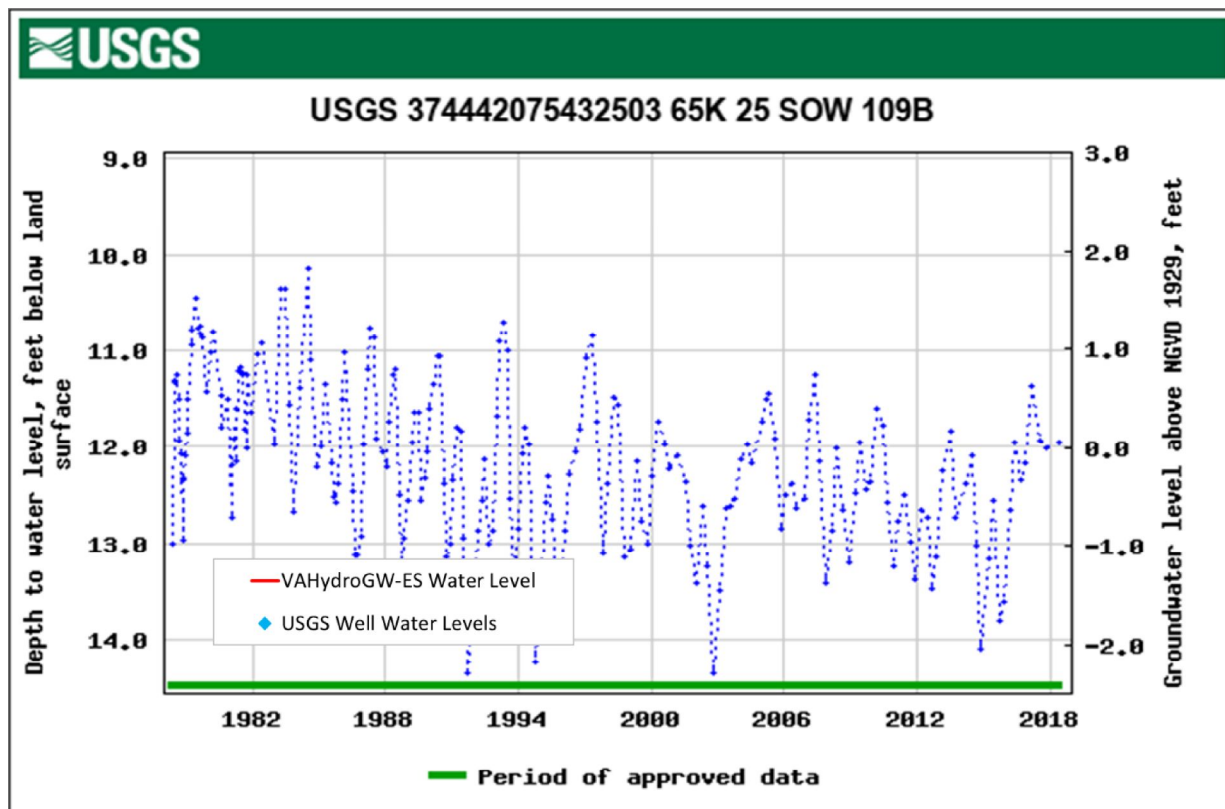


Figure 5. USGS Regional Observation Well 65K 25 SOW 109B, Middle Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 228 ft bls, land surface 12 ft msl).

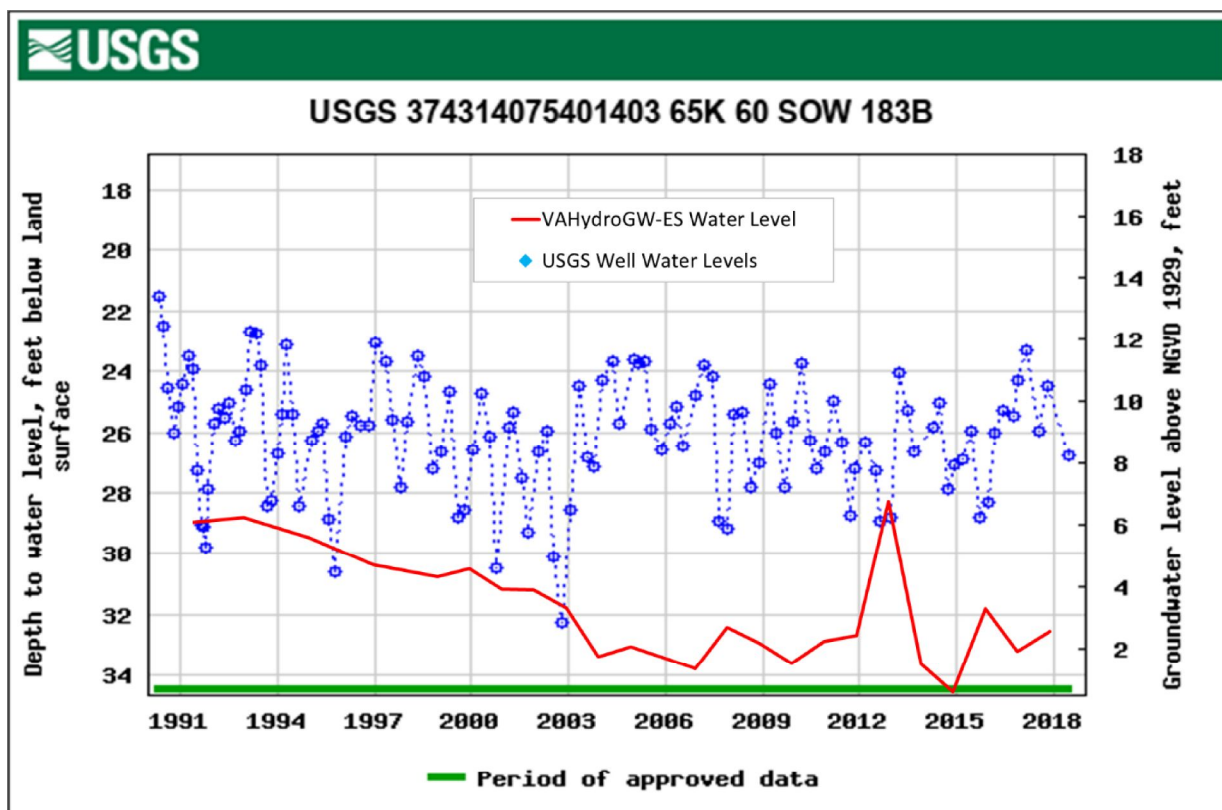


Figure 6. USGS Regional Observation Well 65K 60 SOW 183B, Middle Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 235 ft bls, land surface 35 ft msl).

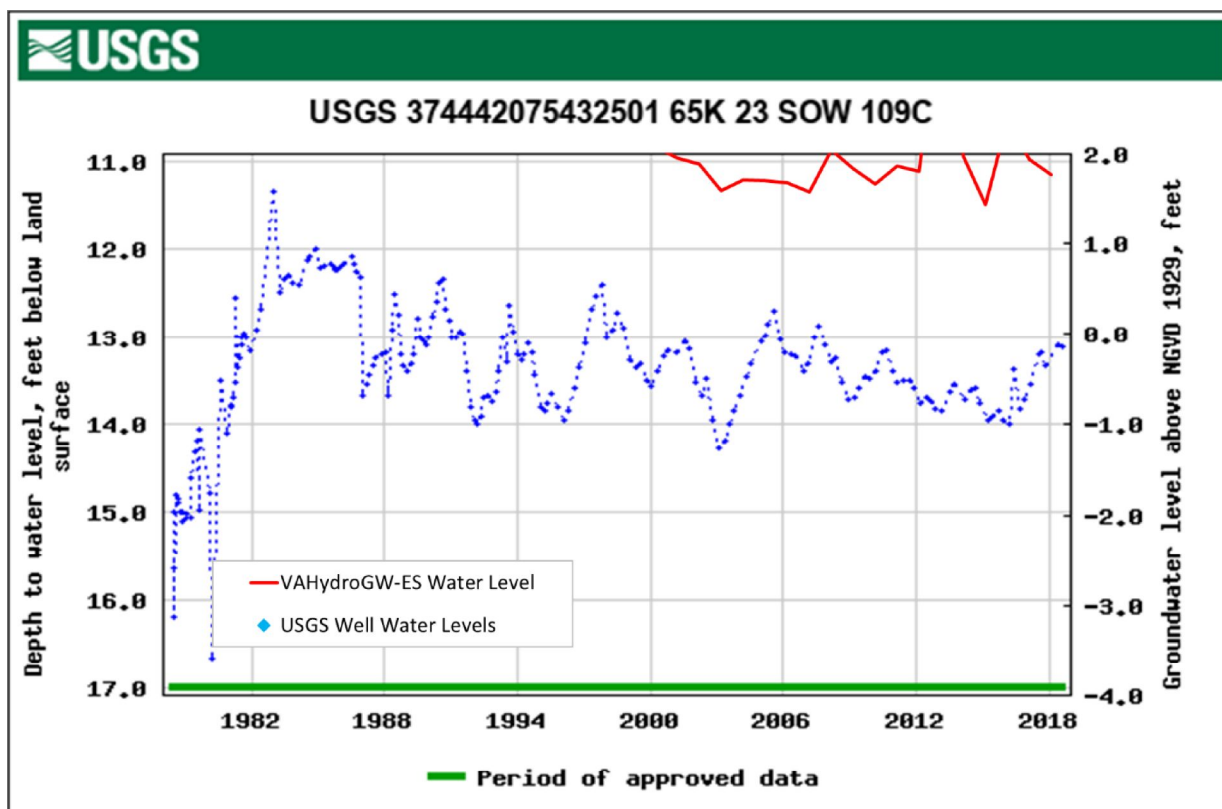


Figure 7. USGS Regional Observation Well 65K 23 SOW 109C, Lower Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 290 ft bls, land surface 13 ft msl).

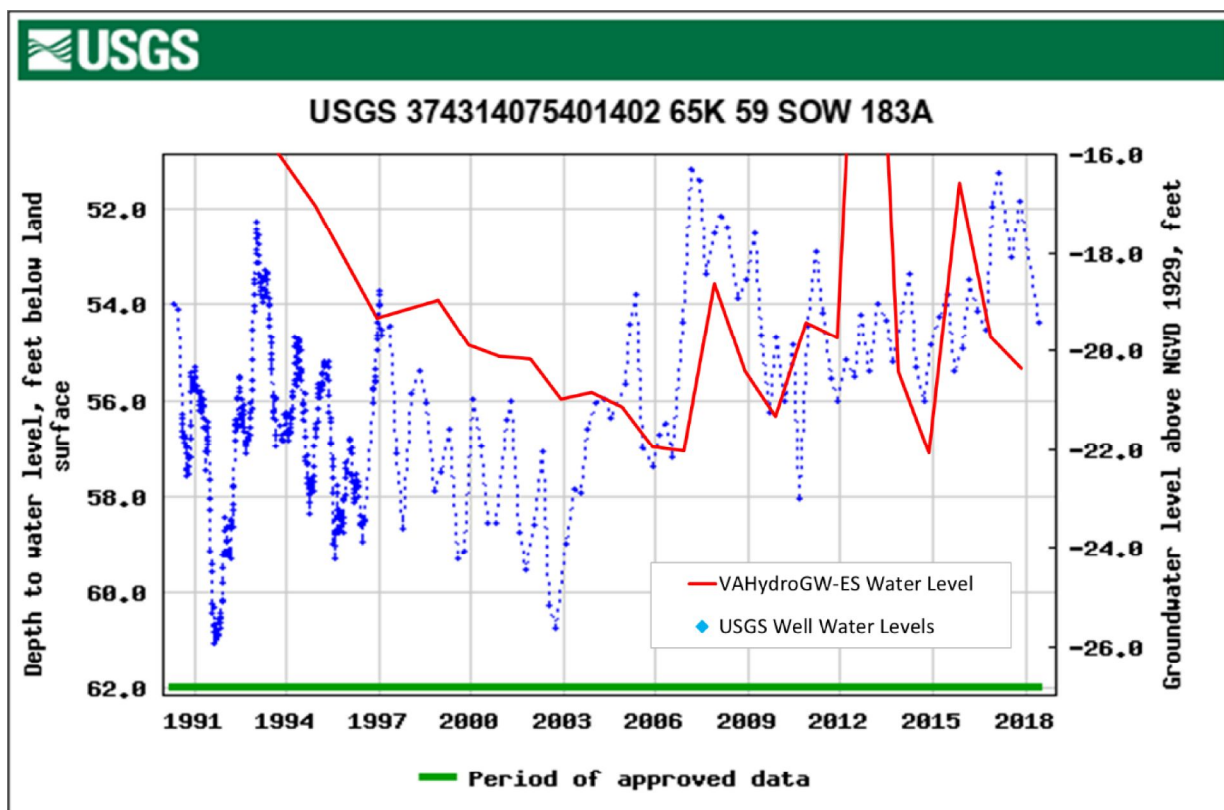


Figure 8. USGS Regional Observation Well 65K 59 SOW 183A, Lower Yorktown-Eastover aquifer water levels recorded from 1990 to present (well depth 285 ft bls, land surface 35 ft msl).

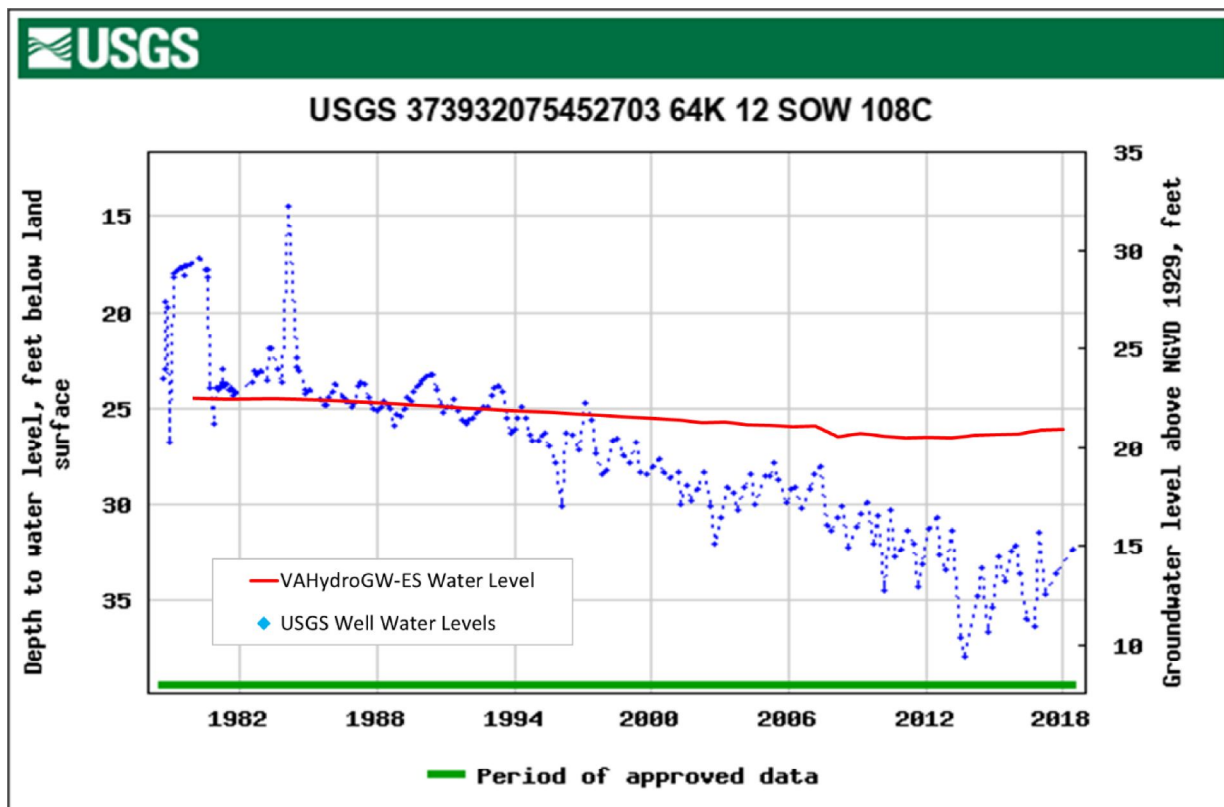


Figure 9. USGS Regional Observation Well 64K 21 SOW 108C, Lower Yorktown-Eastover aquifer water levels recorded from 1978 to present (well depth 284 ft bls, land surface 47 ft msl).

Aquifer Test(s):

An aquifer test has not been conducted for this system and the VAHydroGW-ES model was used to evaluate the application. The following table provides the average hydrogeologic properties assigned to the VAHydroGW-ES cell(s) containing the applicant wells.

Virginia Eastern Shore Model Hydrogeologic Properties: Row 153 & 154/Column 47 & 48							
Aquifer	Top Elevation (feet msl)	Top Elevation (feet bls)	Aquifer Thickness (feet)	Horizontal Conductivity (feet/day)	Vertical Conductivity (feet/day)	Specific Storage (1/feet)	Specific Yield
Columbia	42	0	64	59	0.5	0.00001	0.15
Upper Yorktown-Eastover	-89	131	47	3	3.3	0.000004	N/A
Middle Yorktown-Eastover	-157	199	47	3	3.5	0.000004	N/A
Lower Yorktown-Eastover	-232	275	68	3	2.3	0.000004	N/A

Model Results

Evaluation of Withdrawal Impacts:

The VAHydroGW-ES model was used to simulate the effects resulting from the proposed withdrawal due to the multi-aquifer impacts. The stabilized effects resulting from the proposed withdrawal were simulated at the annual permitted withdrawal rate of 12,000,000 gallons per year (32,876 average gpd). The stabilized effects were simulated by replacing the reported use amounts in the 2017 VAHydroGW-ES Reported Use Simulation with the current maximum annual withdrawal limit allowed under the terms of their permit for all Ground Water Management Area (GWMA) permit holders. That same simulation was executed twice, once with the proposed withdrawal removed (the *baseline simulation*), and once with the proposed withdrawal added (the *proposed withdrawal simulation*). The stabilized effects of the proposed withdrawal were considered by simulating both simulations for 50 years and observing the difference in water potentiometric levels at the end of the simulations.

Area of Impact:

The AOI for an aquifer is the area where the additional drawdown due to the proposed withdrawal exceeds one foot. The results of the VAHydroGW-ES simulations, outlined in the preceding section, predict areas of impact in the Upper and Middle Yorktown-Eastover aquifers. The AOI areas extend a maximum distance of approximately 0.6 and 0.4 miles from the production center for the Upper and Middle Yorktown-Eastover aquifers. AOI maps for all affected aquifers are attached to this report.

80 % Drawdown:

The 80% drawdown criterion was evaluated for all impacted, confined aquifers in the Virginia Eastern Shore using the VAHydroGW-ES *proposed withdrawal simulation*. The elevations of the top of the Upper, Middle, and Lower Yorktown-Eastover aquifers at the VAHydroGW-ES cell (row154, column 48) simulating the greatest drawdown are -89, -158, and -233 feet msl, respectively. Based on the results of the *proposed withdrawal simulation* the predicted potentiometric water levels at the same VAHydroGW-ES cell are 15.3, 17.7, and 13.5 feet msl for the Upper, Middle, and Lower Yorktown-Eastover aquifers, respectively. The 80% drawdown criterion allows the potentiometric water level (based on the critical surface elevation calculated from the VAHydroGW-ES data) to be reduced to -65.5, -121.0, and -182.5 feet msl in the Upper, Middle, and Lower Yorktown-Eastover aquifers, respectively. Therefore, the water levels in the VAHydroGW-ES cell containing the applicant wells for each confined aquifer are not simulated to fall below the critical surface. Additionally, no new VAHydroGW-ES cells are simulated to have water levels fall below the critical surface. Therefore, this withdrawal is within the limits set by the 80% drawdown criterion.

The requested withdrawal is allocated 100% to the Upper Yorktown-Eastover aquifer. The technical evaluation analysis indicated that the apportionment of the requested withdrawal amount among the applicant production wells had no significant effect on the outcome of the technical evaluation.

Water Quality:

The EPA has established the National Secondary Drinking Water Regulations (NSDWRs) which are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic (such as taste, odor, or color) effects in drinking water. The EPA recommends the secondary standards to water systems – states may choose to adopt them as enforceable standards. The EPA NSDWRs specify the limit on chloride as 250 mg/L.

The VAHydroGW-ES was created "to help the Commonwealth and local water managers better plan water use and estimate future changes in water and salinity levels in response to changes in water use."⁴ Use of the model to predict future chloride concentrations results in a "general useful understanding of system behavior, but water-resource managers must be careful in trusting the accuracy of predictions at individual wells from a regional model."⁵ Further, chloride concentrations at individual wells, predicted using the regional model, should not be relied upon to predict actual concentrations at those locations.

The potential for adverse changes to water quality due to the requested withdrawal was evaluated using transient, density-dependent, SEAWAT simulations using the VAHydroGW-ES. Two simulations were executed – one simulation without the proposed withdrawal included and a second with the proposed withdrawal included. Both simulations were executed for 50 years. And both used the 2017 total permitted stresses, concentrations, and heads as starting conditions. In an effort to simulate the long-term effects on water quality due to the proposed withdrawal, the amount of 11,500,000 gallons per year (31,506 average gpd) was used for the duration of the second simulation. The two simulations were compared to evaluate the potential for adverse changes to water quality. The results indicated that no model cells simulate an increase in chloride concentration greater than 20 mg/L due to the proposed withdrawal. Therefore, the VAHydroGW-ES model results do not indicate the potential for reduced water quality as a result of the proposed withdrawal.

Conclusion:

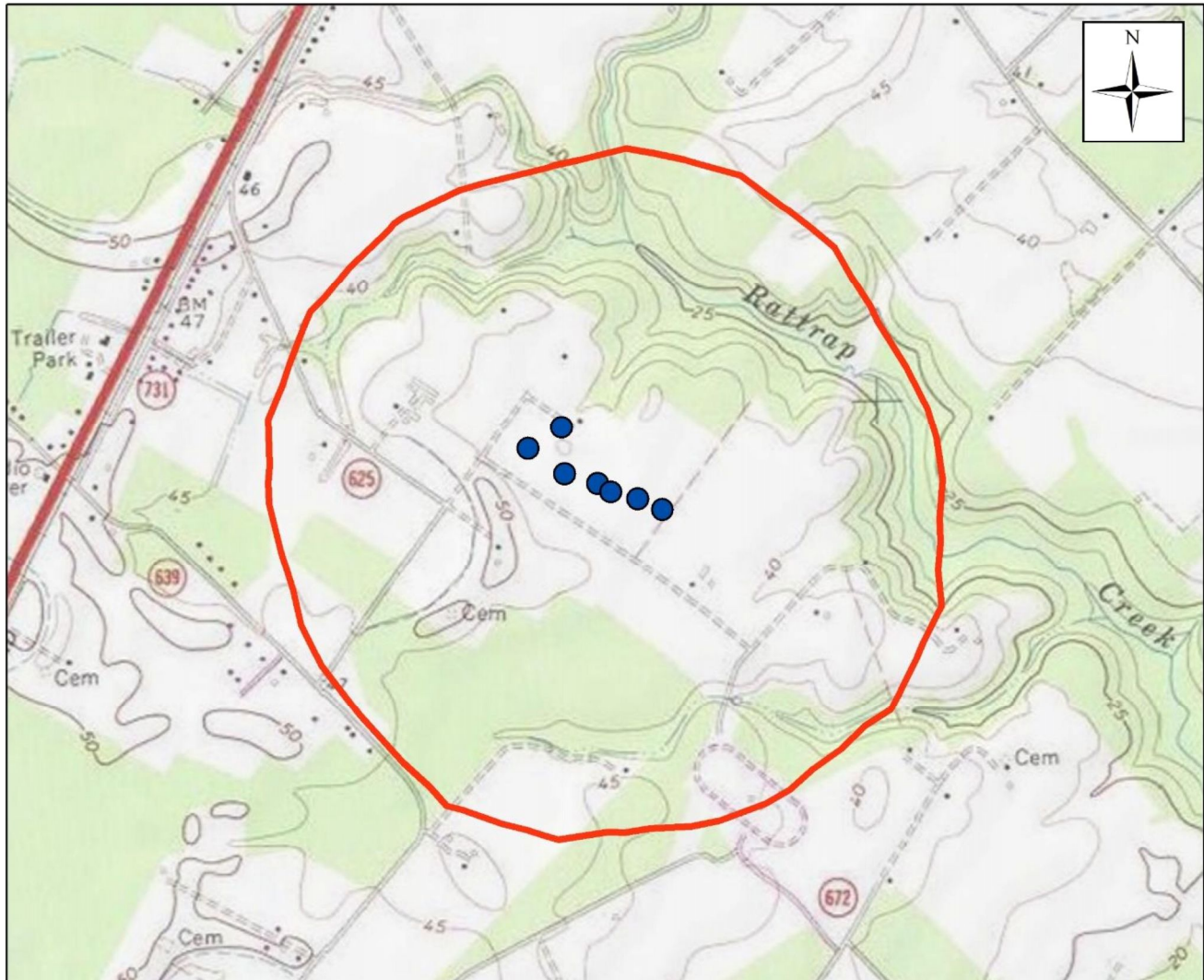
The withdrawal requested by William Davis Lovell and Therese B. Lovell for the Old Mill Farm withdrawal satisfies the technical evaluation criteria for permit issuance. The AOIs for the Upper and Middle Yorktown-Eastover aquifers are shown in the following maps. There are no existing permitted wells located within the applicant's AOI.

⁴ Sanford, W.E., Pope, J.P., and Nelms, D.L., 2009, Simulation of groundwater-level and salinity changes in the Eastern Shore, Virginia: U.S. Geological Survey Scientific Investigations Report 2009–5066, 125 p.

⁵ Sanford, W.E. and Pope, J.P., 2009, Current challenges using models to forecast seawater intrusion: lessons from the Eastern Shore of Virginia, USA. Hydrogeology Journal (2009), Volume: 18, Issue: 1, p: 73-93

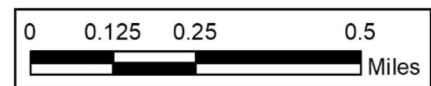
Old Mill Farm

Area of Impact - Upper Yorktown-Eastover Aquifer



● Old Mill Farm Wells

○ Upper Yorktown-Eastover Aquifer Area of Impact



Simulated drawdown at or exceeding one foot in the Upper Yorktown-Eastover aquifer resulting from a 12,000,000 gallon per year (32,876 average gpd), 50 year withdrawal from the Upper Yorktown-Eastover aquifer using the VAHydroGW-ES.

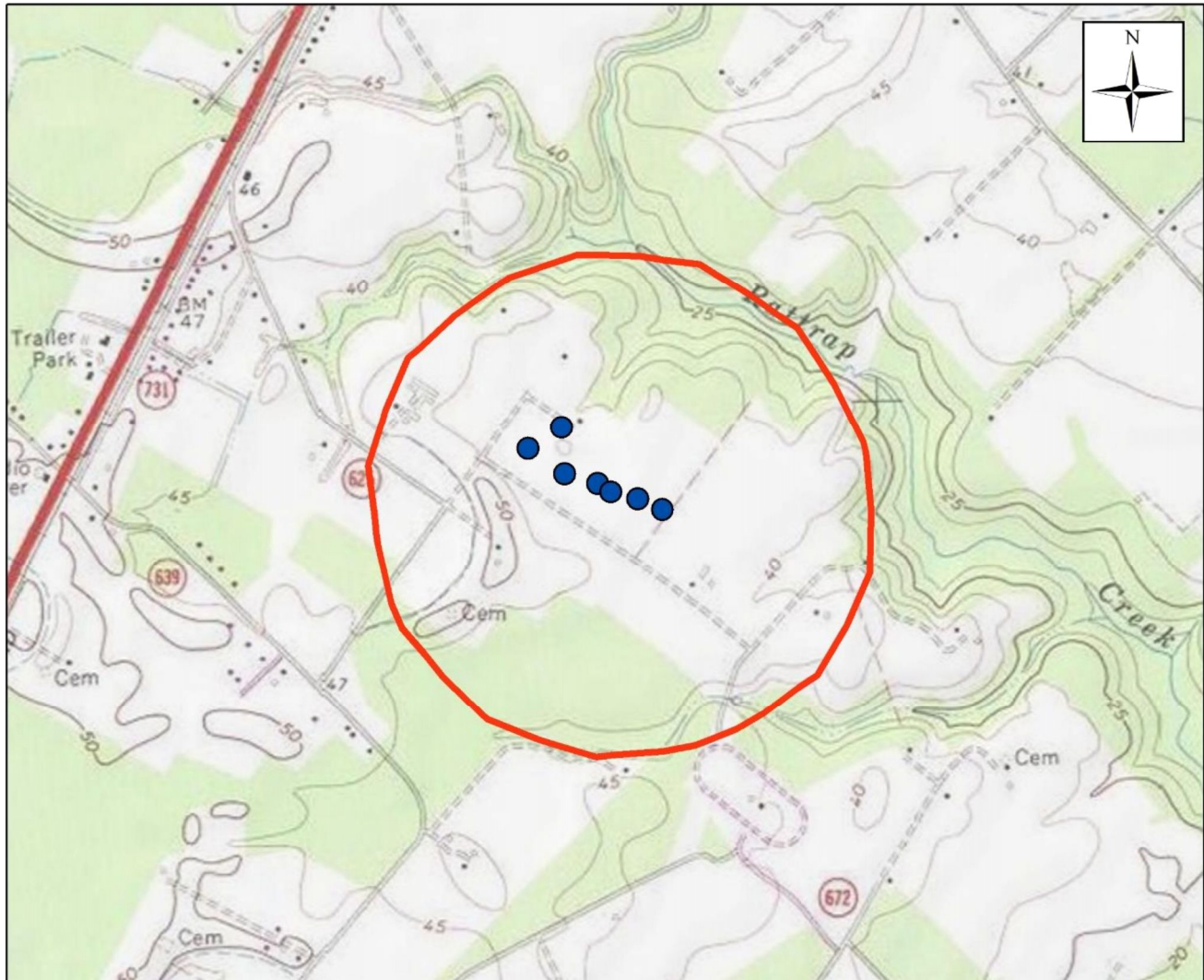
Maximum radius of one foot drawdown (Area of Impact) extends approximately 0.6 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018



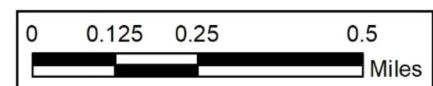
Old Mill Farm

Area of Impact - Middle Yorktown-Eastover Aquifer



● Old Mill Farm Wells

○ Middle Yorktown-Eastover Aquifer Area of Impact



Simulated drawdown at or exceeding one foot in the Middle Yorktown-Eastover aquifer resulting from a 12,000,000 gallon per year (32,876 average gpd), 50 year withdrawal from the Upper Yorktown-Eastover aquifer using the VAHydroGW-ES.

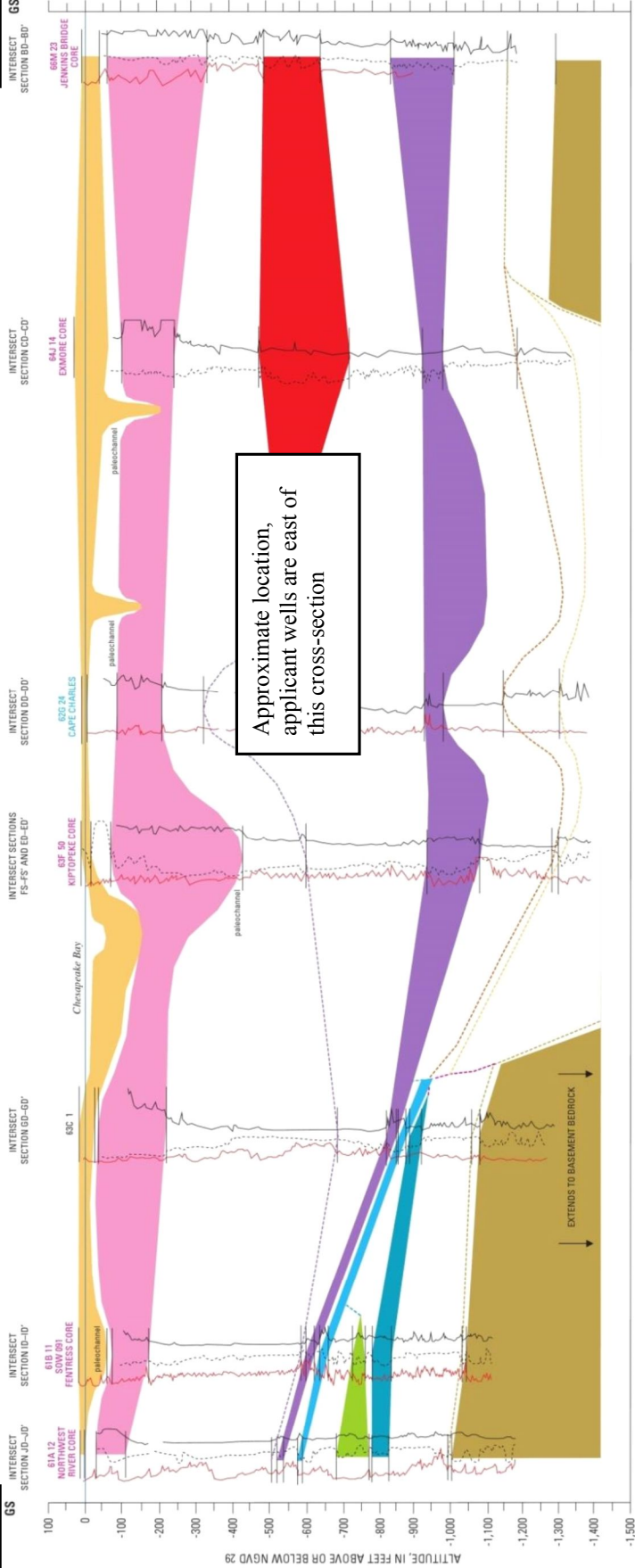
Maximum radius of one foot drawdown (Area of Impact) extends approximately 0.4 miles from the pumping center.

Technical evaluation performed by Aquaveo, LLC for the Virginia DEQ, Office of Water Supply
December 14, 2018



SOUTH

NORTH



Coastal Plain (2006) Cross-Sections GS-GS' from USGS Professional Paper 1731.